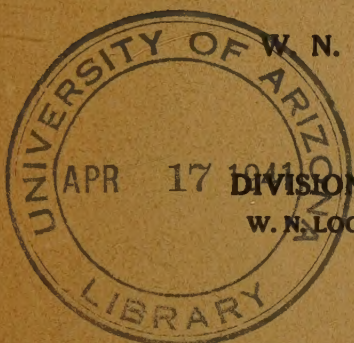


GEOLOGICAL CONDITIONS
IN THE
Oil Fields of Southwestern Indiana

BY

W. N. LOGAN, Ph.D.



DIVISION OF GEOLOGY

W. N. LOGAN, State Geologist

CONSERVATION COMMISSION

W. A. GUTHRIE, Chairman
STANLEY COULTER
JOHN W. HOLTZMAN
E. M. WILSON, Secretary

PUBLICATION No. 42

THE DEPARTMENT OF CONSERVATION
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INTRODUCTION.

The oil industry of the southwestern part of Indiana has attained first rank in production among the petroliferous areas of the state. It is largely through the efforts of the operators in this field that the total production of Indiana has been maintained at a level above one million barrels annually in recent years.

The attention of members of the technical force of the Division of Geology has been directed toward the oil industry in the southwestern part of Indiana during portions of the past three field seasons (1921, 1922 and 1923). While occupied in the study of the coal resources of this part of the state, a portion of the time of the field force was given to the study of problems connected with the oil industry.

In 1920 the writer published a report on "Petroleum and Natural Gas in Indiana," in which reference was made to the work which had been done in this field up to that date. In the summer of 1921, H. L. Barnett and W. P. Rawles, members of the field party, spent several weeks in the field collecting data on production, depth to sands, and taking the elevations of wells. During the field seasons of 1922 and 1923 the writer in charge of field parties consisting of members, Glen Bartle, R. E. Esarey, M. A. Harrell, Albert Hoadley, R. S. Hunt, F. E. Madenwald, W. P. Rawles and A. W. Thomas, collected further data, located wells, secured their logs and determined their elevations.

In order to aid the oil industry in the development of present known petroliferous areas and to present facts which may aid in the development of possible unknown areas, the present report has been prepared.

STRATIGRAPHICAL CONDITIONS.

Mississippian Strata—The lowest formations encountered by the drill in the petroliferous areas of southwestern Indiana are of Mississippian age. In only a few wells has the drill descended below the Chester Division of the Mississippian. The Chester of Indiana consists, according to Malott*, of a basal group containing the following formations:

Beech Creek limestone
Elwren sandstones and shales
Reelsville limestone
Sample sandstones and shales
Beaver Bend limestone
Mooretown sandstones
Paoli Limestone.

Lower Chester Group—The thickness of the Lower Chester group varies from 260 to 300 feet in the area under discussion. Along the border of outcrop of this group the thickness is from 170 to 200 feet.

The Paoli formation is composed entirely of limestone at some points but at others it consists of shales, limestones and sandstones. Its thickness is usually from 50 to 60 feet. The drillers often designate it as the "Mississippi lime". It is oil-bearing in some pools.

The Mooretown formation is usually a sandstone but is broken up by thin beds of shales and limestones in some places. It is an oil-bearing horizon in many of the pools and sometimes contains two or more oil-bearing horizons separated by thin beds of shale or limestone.

The Beaver Bend limestone is usually designated by the drillers as the "Big Lime". It is commonly found to be a hard gray limestone having a thickness near the outcrop of about 15 feet but reported at as much as 40 feet by some drillers. It is rarely absent and rarely broken up though occasionally either may occur.

The Sample sandstone near its outcrop is usually about 35 feet in thickness. The Sample interval is sometimes occupied by shales or limestones. It is oil-bearing in some pools and may contain one or more petroliferous horizons.

The Reelsville formation is, normally, near its outcrop, a thin limestone of brown color. In the well logs it is usually reported but the thickness varies from 3 feet to 18 feet. In some logs it is reported as two or three thin beds of limestone separated by thin shale beds. The limestone and the associated shale are frequently reported as "red" rock.

The Elwren formation is in some places wholly shale, in others wholly sandstone. The thickness near the outcrop is about 35 feet. In the well logs it varies in thickness from 20 to 45 feet. In some localities it contains one or more oil-bearing horizons.

The Beech Creek formation near its outcrop has a thickness of about 15 feet. The thickness recorded in the well logs is from 10 to 40 feet. It is usually unbroken by partings but in some places is broken by shale partings which are frequently identified as "red" rock.

* See "Handbook of Indiana Geology" for fuller discussion.

Middle Chester Group—The formations included in the Middle Chester of Indiana are:

Glen Dean limestone
Hardinsburg sandstone
Golconda limestone
Indian Springs shale
Cypress sandstone.



Fig. 1. View of "Jug Rock" at Shoals, Ind. An erosion remnant from the Mansfield sandstone.

The total thickness of the group near its outcrop is 160 feet. In the petroliferous area of southwestern Indiana the thickness of the group varies from 160 to 225 feet.

The Cypress formation is, near its outcrop, a sandstone which is easily recognized by its fineness of grain and by its position as it immediately overlies the Beech Creek limestone. Its thickness near the outcrop is about 60 feet. In some of the well logs it has a thickness approaching 100 feet and in some of the logs it is composed almost entirely of shale. It contains gas and oil-bearing horizons, in some places as many as three being present.

The Indian Springs formation consists of about 20 feet of greenish to purplish colored shales as seen near the outcrop. In some of the well logs the formation is largely sandstone or limestone with thicknesses varying from 10 to 35 feet.

The Golconda formation is usually composed of thin bedded limestones and shales. Near the outcrop area it has a thickness of about 15 feet. In the well logs the formation varies in thickness from 15 to 40 feet. In some logs the limestone is replaced wholly by shale or sandstone.

The Hardinsburg formation, near its area of outcrop, is a sandstone having a thickness of about 30 feet. In the well logs much of the sandstone is frequently replaced by shale and even thin beds of limestone may appear. In some logs the thickness shows a decided increase. In some oil pools it is gas or oil-bearing, or both. In some places it has more than one productive horizon.

The Glen Dean formation is a limestone member near the area of outcrop but in some well logs the formation is recorded as composed largely of shale. Its thickness is from 25 to 40 feet in the region of its outcrop but in the well logs the thickness varies from 20 to 50 feet though it is usually about 30 feet.

Upper Chester Group—This group is represented in Indiana by a series of sandstones, shales and limestones having a total thickness of from 100 to 200 feet. In the region of the outcrop the thickness is about 125 feet. The long erosion interval preceding the deposition of Pennsylvanian sediment produced a great irregularity in the thickness of the Upper Chester group, some of the upper members being removed completely.

The following members of the Upper Chester have been recognized in Indiana:*

- Negli Creek limestone
- Mt. Pleasant shales and sandstones
- Bristow shale and sandstone
- Buffalo Wallow shales
- Siberia limestone
- Tar Springs sandstone.

The Tar Springs formation, near the area of its outcrop, is usually a fine grained sandstone having a thickness of about 50 feet. It fre-

* Unpublished report by Dr. C. A. Malott on Perry County.

quently contains petroliferous evidences in the form of exuding oil-like or tar-like substances. In the petroliferous areas of southwestern Indiana it varies much between sandstone and shale phases and in thickness, its thickness in some well logs apparently approaching 100 or more feet.



Fig. 2. View showing cross-bedded Mansfield sandstone near Dover Hill. The honey-combed surface is due to differential weathering on alternate hard and soft surfaces.

Gas and oil evidences are present in it according to some of the well records.

The Siberia limestone is a thin limestone, varying near the outcrop, from 2 to 10 feet in thickness. In the well logs it is usually present with similar limits as to thickness. Because of its persistence and its

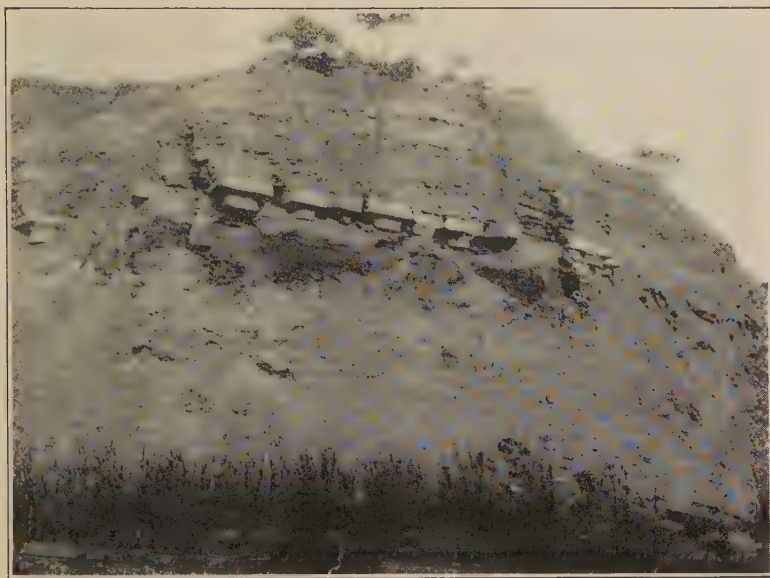


Fig. 3. Limestone and shale horizon above Minshall Coal. An oil-bearing horizon lies in the sandstone below the Minshall. View at Huntingburg.



Fig. 4. Limestone layer and black sheety shale overlying Coal V in a strip pit at Boonville. An easily recognizable horizon in the Pennsylvanian of southern Indiana.

relation to the underlying Tar Springs formation it is usually readily recognized.

The Buffalo Wallow and the remaining formations are not so easily recognized in the well logs although they are present in many.

Pennsylvanian Strata—The upper 900 to 1,200 feet of the bed rock in the southwestern part of Indiana is occupied by strata of Pennsylvanian age. The following constitutes the subdivision of the Pennsylvanian as far as they have been differentiated in Indiana:

Post-Allegheny

Merom

Shelburn

Allegheny

Petersburg

Staunton

Pottsville

Brazil

Mansfield.

Pottsville Group—The Mansfield formation rests unconformably on the eroded surface of the Mississippian system. It is composed of sandstone largely, though it also contains some shale and beds of coal. The sandstones are usually made up of coarse quartz grains but in some outcrops gravel or a conglomeratic condition prevails. Near the area of outcrop strong dips occur on the unconformity, as much as 90 feet in one-half mile. Though the thickness usually varies from 100 to 200 feet there are places where thicknesses of several hundred feet prevail. In limited areas as many as three minable beds of coal exist.

The Mansfield is a petroliferous horizon in some parts of the southwestern oil producing area but the amount of production from this horizon in Indiana is very limited. It is somewhat easily recognized by the drillers because of the presence of water in its coarse basal portion.

The Brazil division of the Pottsville group in Indiana has a thickness of about 80 feet in the region of its outcrop. It contains four coal beds: Lower Block, Upper Block, Minshall and Coal II. These are separated by beds of shale, sandstones and limestone.

One or more oil-bearing horizons occur in this division in one or two pools. The most easily recognizable horizon in the division is the limestone which occurs above the Minshall coal. The oil-bearing horizon is in a sandstone below the limestone.

Allegheny Group—The Staunton division of the Allegheny group contains three coals: Coal III, IIIa and IV. These coals are separated by beds of shale, limestone and sandstone. The total thickness of this division near the outcrop is about 185 feet. In the petroliferous areas the thickness is from 250 to 300 feet. No oil-producing sands are known to exist in this division, although indications of oil have been found in it.

The Petersburg division contains three major coal beds: V, VI and VII, and minor beds among which are IVa and Va. These beds are intercalated with beds of shale, sandstone and limestone. The most readily



Fig. 5. Sandstone above Coal III. An oil-bearing sand in some places. View at Nail's Mill, Clay County.

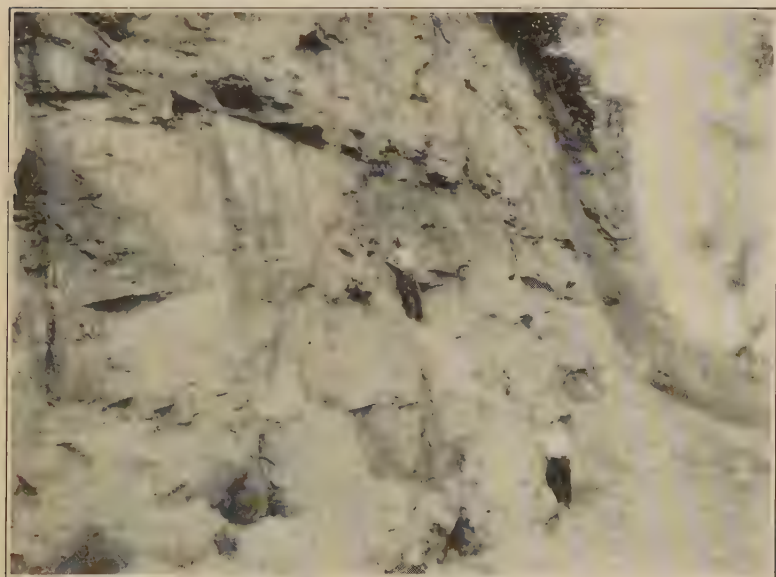


Fig. 6. Shelton Cliff sandstone in upper part of the Pennsylvanian in southwestern Indiana. View at Shelton Cliff, Gibson County.

distinguishable horizon is the limestone and black sheety shale which occurs above Coal V. The thickness of the division near the region of outcrop is about 200 feet. In the well logs of the petroliferous areas the thickness is as much as 300 feet. Oil has been found in small quantities in the sandstone above Coal V.

Post-Allegheny Group—The stratigraphy of the Post-Allegheny division has not been carefully differentiated in the petroliferous areas. The formations consist of a series of sandstones, shales and limestones containing five or more beds of coal. The principal beds have been named Coal VIII, Coal IX, Parker, Friendville and Aldrich. The horizon of Coal VIII may be recognized in most well records by the presence of the Sommerville limestone lying about it. The horizon of the Friendville coal is also conspicuous because of the presence of black sheety shale and limestone above it. Two rather massive sandstones, the Merom or Inglefield sandstone and the Shelton Cliff sandstone, appear. No petroliferous horizons have been found in the Post-Allegheny formations of the Indiana region.

Geological Formations Containing Gas and Oil.

The following geological formations in southwestern Indiana contain oil and gas bearing horizons. One or more gas or oil bearing horizons occur in each of the formations:

Brazil	{ West Princeton sand Davidson shallow sand.
Mansfield	{ Bridgeport sand McRoberts sand Monroe City gas sand.
Tar Springs	{ Davidson deep sand Colvin sand Loveless sand.
Hardinsburg	{ Buchanan sand Hightower shallow sand Hoover gas sand.
Cypress	{ Hoover oil sand. Zimmerman sand. Cunningham shallow sand Hyneman shallow sand.
Elwren	{ Snyder shallow sand Willis sand Barker sand.
Sample	{ Nixon sand Hunt deep sand Cunningham deep sand.
Mooretown	{ Hightower deep sand Snyder deep sand Petersburg sand.



Fig. 7. Sandstone above the horizon of Coal VIII, probably the Inglefield sandstone. View on Patoka River in Gibson County.

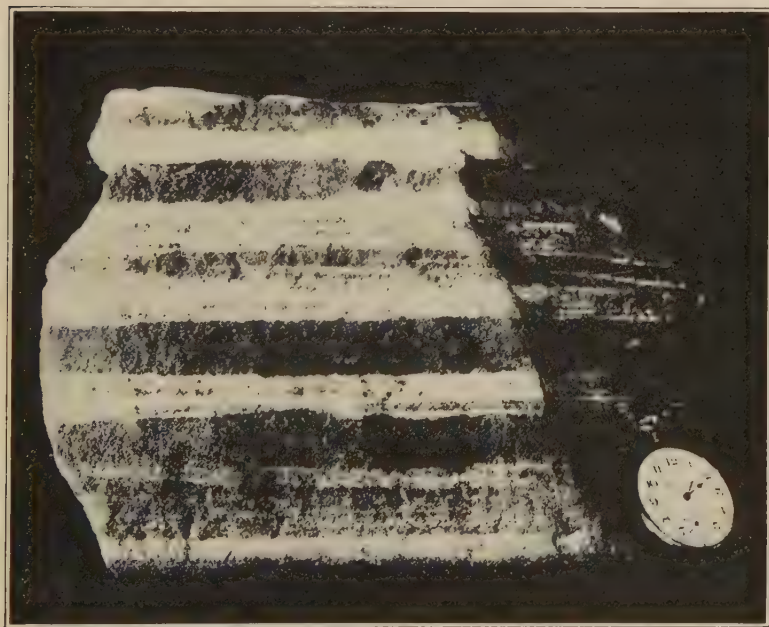


Fig. 8. Sandstone above Coal V. An oil-bearing horizon. Light streaks only partly saturated with oil, dark streaks completely saturated.

Paoli	{	Oakland City sand
		Brown sand
		Vierling sand
	{	Monroe City deep sand.

Oil-Bearing Formations in Various Pools.

The formations which contain oil and gas in the various pools of southwestern Indiana are indicated as follows:

Alford pool	{	Mooretown
		Paoli.
Bowman	{	Brazil
		Tar Springs
		Hardinsburg
	{	Cypress
		Elwren
	{	Mooretown
Davidson		Paoli.
	{	Brazil
	{	Mansfield
Hoover		Tar Springs.
	{	Mansfield
		Tar Springs
		Hardinsburg
	{	Cypress
		Sample
	{	Mooretown
Mt. Olympus		Paoli.
	{	Hardinsburg
		Cypress
	{	Sample
Francisco		Mooretown.
		Sample.
McDonald	{	Tar Springs
	{	Mansfield.
Oatsville	{	Mooretown
	{	Paoli.
Hightower	{	Hardinsburg
	{	Mooretown.
West Princeton		Brazil.
Oakland City	{	Mooretown
	{	Paoli.

MARTIN COUNTY.

Geological Conditions—The larger part of the surface of Martin County lies within the outcrop of the Pottsville division of the Pennsylvanian system. A much smaller area is occupied by rocks of Mississippian age. Except for some filled-in valleys, the bed-rock strata are little concealed by glacial deposits. The general accessibility of the strata renders stratigraphical and structural work possible, though the pronounced unconformity between the Pottsville and the Mississippian adds somewhat to the difficulties of correct interpretation.

A general section of the rocks exposed in the county would include representatives from the St. Louis limestone of the Mississippian to the upper Pottsville of the Pennsylvanian.

A generalized section includes formations as follows:

Pleistocene and Post-Pleistocene sand, gravels, clay.....	0 - 60 feet
Tertiary gravels and sands in a few places probably.....	0 - 10 feet
Pennsylvanian—(Brazil) shales, coals, sandstones.....	50 - 70 feet
Pennsylvanian—(Mansfield) sandstone, shales, coal.....	150 - 200 feet
Mississippian—(Chester) shales, sandstones, limestones...	300 feet
Mississippian—(Meramecian) limestones	100+ feet

From deep well records the following section appears to be present in the central portion of the county:

Pennsylvanian—Pottsville (Mansfield sandstone).....	60 feet
Mississippian— Golconda, limestone and shale.....	30 feet
Mississippian— Indian Spring shale and sandstone.....	35 feet
Mississippian— Cypress sandstone	25 feet
Mississippian— Beech Creek limestone.....	40 feet
Mississippian— Elwren shale	20 feet
Mississippian— Reelsville limestone	20 feet
Mississippian— Sample, shale and sandstone.....	10 feet
Mississippian— Beaver Bend limestone.....	20 feet
Mississippian— Mooretown sandstone shale.....	30 feet
Mississippian— Paoli limestone	70 feet
Mississippian— St. Genevieve limestone.....	100 feet
Mississippian— St. Louis limestone.....	160 feet
Mississippian— Salem limestone	80 feet
Mississippian— Harrodsburg limestone (Warsaw).....	100 feet
Mississippian— Borden or Knobstone limestones and shales...	640 feet
Devonian— New Albany black shale.....	100 feet
Devonian— Erian limestone	46 feet
Silurian— Silurian limestone and sandstone.....	414+ feet

To bottom of deepest well.

The top of the Trenton limestone probably lies about 1,000 feet below the top of the Devonian limestone.

Oil Sands—The possible oil-bearing horizons in Martin County are the lower Pottsville (Mansfield sandstone), the Cypress sandstone, the Sample sandstone, the Mooretown sandstone, the Paoli limestone, the Devonian limestone, and the Trenton limestone.

The probabilities of obtaining oil in the Pennsylvanian and Mississippian sands should increase toward the western part of the county. There is usually a showing of oil in the Devonian but not many tests of the Devonian have been made in Martin County. The Trenton limestone has not been productive to any extent outside of the Trenton field in the northeastern part of the state. Some oil was found in the southwestern part of Monroe County and some in the eastern part of Lawrence County in the Trenton. No wells have reached the Trenton in Martin County. A showing of oil was obtained in the Devonian in the well drilled on the Zalmon farm one mile west of the Martin County court house at Shoals in 1919.

In a well drilled on the J. B. Marshall farm, Sec. 10, T. 3 N., R. 4 W., a showing of oil was obtained in the Mooretown sand at a depth of 329-341 feet.

Key Horizon—The best key horizon in Martin County for use in determining the structural conditions, is the line of contact between the Cypress sandstone and the Beech Creek limestone. As a usual thing the Cypress sandstone rests directly upon the surface of the Beech Creek, as it does northwest of Dover Hill, without intervening shale layers. Care must be exercised in following the key horizon, that the observer does not confuse contact of the Mansfield with some of the Chester limestones, with the Cypress-Beech Creek contact. The Mansfield in Martin County is usually coarser than the Cypress, white quartz pebbles often appearing especially near the base of the formation. The Mansfield is also characterized in many outcrops by a distinct honey-comb form of weathering. The position of the Beech Creek limestone is often marked by the presence at its base of caves and bold springs.

The regularity of thickness of the Beech Creek, the presence of bold springs at its base, the massive fine grained character of the Cypress lying immediately above the limestone, render the contact easy of recognition and materially lessens the possibility of its being confused with other limestone contacts of frequent occurrence in the Chester group of rocks.

Oil Development—A small oil pool was developed east of Loogootee in Perry township in the southwest part of section 19, the northwest part of section 30 and the southeast part of section 24. Dry holes were drilled in sections 1, 19 and 36. (See Map.) In 1915 three of these wells were producing about 20 barrels per day each. Some of the wells in the field are still producing. Gas was found in 1899 and oil in 1901. Between 25 and 30 wells were drilled. Six of these wells have produced oil for more than twenty years.

Geological Formations—The rocks of the surface in the Loogootee oil pool belong to the Pottsville division. The Mansfield sandstone rests apparently upon the Glen Dean limestone of the Chester group. The horizons of the Hardinsburg and the Golconda seem clearly marked in the well records but the formations intervening between the Sample and the Golconda are not so clearly differentiated in the records available. The lowest formation encountered by the drill is the Paoli lime-

stone. The Mooretown sandstone and the Beaver Bend formation lying above the Paoli limestone have about their normal thickness.

Oil Sand—The oil sand seems to be in the Mooretown formation. It is a quartz sand having a thickness of 15 feet and lies between two shale beds. The Mooretown sand in a well on the Marshall farm, section 10, T. 3 N., R. 4 W., contained a showing of oil. The oil-bearing sand in the latter well was 12 feet thick. It had overlying it about 11 feet of shale and sandstone in alternate layers.

The following is the log of one of the wells:

J. and P. Larkin Well No. 6.

Section 19, T. 3 N., R. 4 W. Elevation, 610 Feet.

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Surface clay	10	10	White shale	50	335
Fire clay	30	40	Dark shale	30	365
Sand	15	55	White shale	20	385
Grey clay	15	70	Sandstone	75	460
White limestone	15	85	Hard brown limestone (Beaver Bend)	12	472
Dark shale	50	135	Dark shale (Mooretown) ..	15	487
Sandstone (Mansfield) ...	50	185	Sand (Mooretown)	15	502
Limestone (Glen Dean) ...	25	210	White shale (Mooretown) ..	5	507
Brown shale	30	240	Dark limestone	12	519
White shale	15	255	Total depth		519
White sand	20	275			
Brown lime	10	285			

Well Logs.

The following logs of wells drilled in Martin County have been received:

Center Township—A well was drilled on the Zalmon farm, one mile west of Shoals in section 26, by G. B. Wilt in 1919. Elevation about 500 feet. The record of the well as furnished by Mr. Wilt is as follows:

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Sand (Mansfield)	60	60	Lime, very hard (Beaver Bend)	5	245
Slate, blue (Golconda) ...	10	70	Lime, pressure of gas (Beaver Bend)	15	260
Crevice, mud and stone (Golconda)	10	80	Brake (Mooretown)	30	290
Lime, hard (Golconda) ...	5	85	Lime (Paoli)	40	330
Crevice, bad hole (Indian Springs)	5	90	Lime	30	360
Slate, black in crevice (In- dian Springs)	5	95	Slate, soft blue (St. Gene- vieve)	10	370
Sand, in crevice (Indian Springs)	15	100	Lime, hard	40	410
Crevice, in sand and lime (Indian Springs)	10	120	Lime, hard, grey and gritty ..	20	430
Crevice, tools stuck (Indian Springs)	5	125	Lime, brown	14	444
Sand, Cypress	25	150	Brake, soft and shelly	16	460
Lime, Beech Creek	40	190	Lime, hard, sharp and gritty (St. Louis)	40	500
Brake, Elwren	20	210	Lime (St. Louis)	40	540
Lime, Reelsville	20	230	Lime, hard, not gritty (St. Louis)	40	580
Brake, Sample	10	240	Lime (St. Louis)	40	620
			Lime, soft (Salem)	40	660

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Lime, soft	40	700	Lime, cased 8 in. (Knobstone)	20	1120
Lime, grey, harder and some grit (Harrodsburg) ..	20	720	Lime, hard, gritty (Knobstone)	30	1150
Lime, blue and brake, 2. ft. slate (Harrodsburg)	20	740	Lime, hard (Knobstone) ..	30	1180
Lime, hard, blue (Harrodsburg)	20	760	Lime, hard, dark brown (Knobstone)	20	1200
Lime, hard, grey (Harrodsburg)	20	780	Lime (Knobstone)	50	1250
Lime, blue lick water (Harrodsburg)	20	800	Lime, broken, shelly and slate (Knobstone)	30	1280
Lime (Knobstone)	20	820	Shale, blue (Knobstone) ..	60	1340
Lime (Knobstone)	20	840	Shale, blue (Knobstone) ..	100	1440
Lime (Knobstone)	25	865	Shale, brown with oil (Devonian)	100	1540
Lime (Knobstone)	25	890	Shell, hard, showing of oil (Devonian)	8	1548
Lime (Knobstone)	25	915	Lime (Devonian)	38	1586
Lime (Knobstone)	20	935	Lime, hard (Silurian)	134	1720
Lime, blue (Knobstone) ..	20	955	Lime, hard (Silurian).....	100	1820
Lime, blue (Knobstone) ..	20	975	Sand, mixed and lime) Silurian)	20	1840
Lime, white (Knobstone) ..	20	995	Lime, hard blue (Silurian)	60	1900
Lime, blue (Knobstone) ..	15	1010	Sand (Silurian)	40	1940
Lime, hard (Knobstone) ..	30	1040	Blue lick water at 1930 feet.		
Lime, hard, sharp (Knobstone)	20	1060	Lime (Silurian)	60	2000
Lime (Knobstone)	40	1100			

Shut down for casing. Water within 25 feet of top of hole.

This well was not completed to the intended depth. The well was drilled 414 feet into the Silurian but did not reach the Trenton limestone. A showing of oil was obtained from the Devonian limestone.

A well drilled in section 10, T. 3 N., R. 4 W. by Noble and Bolyard on the Marshall farm obtained a showing of oil in the Mooretown division of the Chester group.

The log of the well as furnished by Mr. H. L. Barnett is as follows:

Elevation about 610 or 620 feet.

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Clay, red	14	14	Shale and broken sand (Hardinsburg)	20	210
Clay, yellow	8	22	Shale, broken lime (Hardinsburg)	10	220
Sandstone, red, coarse (Mansfield)	23	54	Limestone, hard, brown (Golconda)	6	226
Slate, light (Mansfield) ...	4	49	Shale, black, soft (Indian Springs)	5	231
Sandstone, yellow, coarse (Mansfield)	56	105	Shale, light (Indian Springs)	5	236
Coal (Mansfield)	1	106	Lime, sandy (Indian Springs)	19	255
Sandstone, yellow, coarse (Mansfield)	21	127	Sand, white fine (Cypress)	30	285
Sandstone, blue, fine (Mansfield)	15	142	Water.		
Slate, light (Mansfield) ...	3	145	Lime, brown, hard (Beech Creek)	20	305
Sandstone, white, fine	10	155	Slate, light (Elwren)	5	310
Water at 150 feet.			Limy sand (Elwren)	8	318
Limestone, white, hard (Glen Dean)	31	186			
Shale, grey	4	190			

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Slate, broken sand (Elwren)	11	329	Shale (Beaver Bend)	2	390
Sand, brown (Elwren) ...	12	341	Lime, brown, hard	13	403
Oil showing.			6¼ in. casing at 393 feet.		
Slate, black (Elwren)	1	342	Slate, light (Mooretown)..	5	408
Sand, grey (Elwren)	3	345	Sand, grey (Mooretown)..	5	413
Slate, blue (Elwren)	5	350	Shale, sandy (Mooretown)..	5	418
Shale, sandy (Elwren) ...	8	358	Shale, dark (Mooretown)..	12	430
Sand, light (Elwren).....	22	380	Lime, white (Mooretown)..	12	442
Slate, light (Elwren)	6	386	Slate, grey (Mooretown)...	3	445
Lime (Beaver Bend)	2	388	Lime, hard white (Paoli)..	28	473
			Total depth		473

A deep well was drilled in section 29 in Halbert township to a reported depth of 2,200 feet. The record of this well was not obtained. It is said to have produced a small quantity of gas. It is probable that this well did not reach the Trenton.

In the eastern part of Shoals, in White River valley, a well was drilled to a depth of 960 feet and mineral water was obtained. This water was probably obtained in the Borden division.

PIKE COUNTY.

Geological Conditions—The bed-rock formations of Pike County lying immediately below the mantle rock belong to the Pennsylvanian period of geological time. The mantle rocks consist of sands, gravels and clays of Pleistocene and Post-Pleistocene age. The thickness of the mantle rock varies from a few inches to more than 100 feet. Except in areas where recent erosion has been intense the mantle rock completely conceals the bed-rock.

The Allegheny division of the Pennsylvanian is represented in the extreme eastern part of the county by the outcrop of the Staunton group of rocks. The rocks consist of shales, sandstone, under-clays and thin limestones. The total thickness of the beds is about 200 feet. Near the lower part of the Staunton group lies Coal III above which are several thin beds of coal. One of these, Coal IIIa, has a thin limestone above it. Coal IV occurs near the upper part of the group.

In the central part of the county the bed-rock formations which occupy the subsurface belong to the Petersburg group of the Allegheny division. In this group are included three coal beds: Coal V, Coal VI and Coal VII. Sandstone, shales and thin limestones make up the remainder of the interval.

The lowermost Post-Allegheny beds are present in the western part of the county.

A generalized section in the eastern part of the county contains the following strata:

Pleistocene and Post-Pleistocene clays.....	40 feet
Petersburg group	160 feet
Staunton group	215 feet
Pottsville group	275 feet
Chester group (Mississippian).....	500 feet
Total known strata.....	1190 feet

A generalized section in the western part of the county contains the following groups with their approximate thicknesses:

Pleistocene and Post-Pleistocene clays.....	50 feet
Post-Allegheny group	100 feet
Petersburg group	240 feet
Staunton group	225 feet
Pottsville group	275 feet
Chester group	400 feet

Clay Township—Oil is obtained in this township from wells in section 27. The sands are comparatively shallow sands occurring in the Tar Springs formation of the Chester division of the Mississippian. The oils occur in a hard brown sandstone and in a soft sandstone. The sandstones are separated by shale or limestone three or four feet in thickness.

The following are the records of three of the wells which are located in section 27 in the Davidson pool:

LOG OF WELL No. 2 ON THE CLAUDE LOVELESS FARM.

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Surface		15	Shale, dark	15	505
Mud, white	15	30	Shale, white	45	550
Sandstone	30	60	Limestone	5	555
Mud	45	105	Shale, black	65	620
Limestone	5	110	Limestone, sandy	10	630
Shale, white	30	140	Shale, black	50	670
Shale, black	45	185	Limestone	5	675
Limestone	15	200	Shale, black	10	685
Coal V	7	207	Limestone, white	5	690
Shale, black	63	270	Shale, black	55	745
Limestone, sandy, hard....	60	330	Sandstone	15	760
Shale, brown	10	340	Shale, black	30	790
Limestone	15	355	Limestone	20	810
Shale, black	45	370	Shale, black	10	820
Limestone, shell	4	374	Shale, sandy	40	860
Shale, white	5	377	Sandstone, white hard		
Limestone	8	385	(Mansfield)	5	865
Shale, white	20	405	Sandstone, water	37	902
Limestone	8	413	Shale, black	3½	905½
Shale, black	7	420	Shale, black	4½	910
Limestone, sandy	10	430	Limestone (Siberia)	5	915
Shale, black	10	440	Shale, black (Tar Sprgs) ..	5	920
Limestone	5	445	Limestone, brown, hard....	8	928
Shale, white	12	457	Shale, black	10	938
Limestone, shell	3	460	Sandstone, brown, hard....	10	948
Shale, black	10	470	Limestone, hard	3	951
Limestone, hard	7	477	Sandstone, soft	18	969
Shale, white	13	490	Limestone, light	1	970

Total depth, 970 feet.

Drilled by A. B. Bement, Terre Haute, Ind. Completed, July 14, 1923.

Little water at 505 feet. Oil at 948-970 feet.

Casing Record—10-inch casing, 108 feet; 8¼-inch casing, 377 feet, pulled; 6½-inch casing, 905 feet; 2-inch tubing, 958 feet.

LOG OF WELL No. 1 ON THE MARY CATT FARM.

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Surface, yellow		15	Shale, white	15	430
Mud	25	35	Limestone	5	435
Sandstone, gray	40	75	Shale, black	30	465
Shale	10	85	Limestone, hard	6	471
Sandstone, gray	13	98	Shale, white	29	500
Limestone	4	102	Limestone	10	510
Shale, black	18	120	Shale, black	50	560
Limestone	10	130	Limestone, sandy	20	580
Shale, white	20	150	Shale, black	40	620
Limestone	5	155	Limestone	5	625
Shale, black	33	188	Shale, black	40	665
Coal V	4	192	Sandstone, white	10	675
Shale, black	48	240	Shale, black	75	750
Limestone	5	245	Limestone, sandy	15	765
Shale, black	55	300	Shale, black	45	810
Limestone	10	310	Sandstone (Mansfield)....	72	882
Shale, white	10	320	Shale, black	18	900
Limestone, sandy	40	360	Shale, black (Tar Sprgs)..	25	925
Shale, black	10	370	Sandstone, shell, hard....	4	929
Limestone	5	375	Shale, black	19	948
Shale, black	35	410	Sandstone	20	968
Limestone	5	415			

Total depth, 968 feet.

Three bailers water at 155 feet. Water at 675 feet. Oil at 968 feet. Oil at 948 feet.

Drilled by A. B. Bement, Terre Haute, Ind. Completed, May 19, 1923.

Casing Record—99 feet 10-inch; 385 feet 8¼-inch, pulled; 900 feet 6½-inch.

LOG OF WELL No. 1 ON THE CLAUDE LOVELESS FARM.

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Surface	1	10	Shale, black	25	475
Mud	20	30	Limestone	475	480
Sandstone, light	20	50	Shale, white	480	525
Mud	20	70	Limestone, sandy	20	545
Sandstone, light	28	98	Shale, black	55	600
Coal VI	1	99	Limestone, sandy	15	615
Mud	4	103	Shale, white	25	640
Limestone	7	110	Sandstone	40	680
Shale, black	10	120	Shale, black	30	710
Limestone	5	125	Limestone, sandy	10	720
Shale, black	35	160	Shale	25	745
Limestone	15	175	Limestone	25	770
Coal V	5	180	Shale, black	40	810
Shale, black	70	250	Sandstone (Mansfield) ...	25	835
Limestone	10	260	Shale, black (Mansfield)...	10	845
Shale, white	55	315	Sandstone (Mansfield) ...	10	855
Sandstone	25	340	Shale, black (Mansfield)...	10	865
Shale, black	30	370	Sandstone, black (Mans- field)	20	885
Limestone	10	380	Shale	10	895
Shale, white	20	400	Limestone (Siberia).....	5	900
Limestone	10	410	Shale	48½	948½
Shale, black	40	450	Sand—Oil (Tar Sprgs)...	21½	970
Limestone	5	455			

Drilled by A. B. Bement, Terre Haute, Ind. Completed, April 17, 1923.

Casing Record—104 feet 6 inches of 12½-inch; 232 feet 1 inch of 10-inch, pulled; 900 feet of 8¼-inch.

In section 5, a gas sand occurs immediately below Coal IV and also in a sand 33 feet below the coal. Oil occurs in a sand in the horizon above upper Block and again in the Mansfield. There are two shallow gas sands and two comparatively shallow oil sands in this township. The Chester formations are worthy of testing. The following is the record of a well drilled in section 5:

WELL No. 3 ON THE JASPER N. DAVIDSON FARM.

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Surface	10	10	Limestone, hard	5	475
Blue mud	35	45	Sandstone, light	11	486
Limestone	12	57	Shale, dark	9	495
Shale, light	25	82	Shale, light	10	505
Shale, dark	72	154	Limestone, hard	6	511
Limestone, gritty	16	170	Shale, light	46	557
Shale, dark	25	195	Limestone, hard	4	561
Limestone, sandy	55	250	Shale, dark	64	625
Shale, dark	95	345	Shale, light	52	677
Limestone, gritty	13	358	Shell, broken	6	683
Shale, light	14	372	Shale, dark	6	689
Shale, dark	48	420	Coal (Minshall)	4	693
Shale, light	10	430	Broken shell	5	698
Shale, dark	6	436	Sandstone, soft (above Up- per Block horizon)....	12	710
Limestone, hard	2	438	Shale, light	27	737
Coal IV	4	442	Shale, dark	24	761
Sandstone	6	448	Limestone	5	766
Limestone, sandy, hard....	16	464	Sandstone (Mansfield)....	15	781
Shale, black	6	470			

Gas at 446 to 448 feet. Gas at 475 to 482 feet. Oil at 700 to 710 feet. Oil at 766 to 777 feet.

Casing Record—12-inch casing set at 40 feet; 10-inch casing set at 163 feet; 8-inch casing set at 452 feet; 6½-inch casing set at 505 feet. Drilled by J. S. Joung, Jr., Robinson, Ill.

Jefferson Township—A slight indication of a terrace-like structure occurs in the southern part of the township. The geological formations present in the bed-rock include:

Allegheny (Petersburg and Staunton).....	260 feet
Pottsville (Brazil and Mansfield).....	490 feet
Mississippian (Chester)	488 feet

A test well drilled on the Gabe Booth farm in section 33 presented the following record:

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Clay	7	7	Sand (water) (Pennsyl- vanian)	11	85
Red sandstone (Pennsyl- vanian)	53	60	Black shale (Pennsyl- vanian)	8	93
White shale (Pennsyl- vanian)	10	70	White shale (Pennsyl- vanian)	67	160
Coal V (Pennsylvanian) ..	4	74			

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Coal IV (Pennsylvanian),	4	164	Shale (Indian Springs) ...	58	895
White shale (Pennsylvanian)	96	260	Sand (Cypress)	20	915
Coal III (Pennsylvanian),	7	267	White sand, water (Cypress)	52	967
White shale (Pennsylvanian)	20	287	Limestone (Beech Creek) ..	15	982
Brown limestone (Pennsylvanian)	12	299	Shale (Elwren)	22	1004
White shale (Pennsylvanian)	101	480	Sand (Elwren)	11	1015
Limestone shell (Pennsylvanian)	5	485	Shale (Elwren)	30	1045
Blue shale (Pennsylvanian) ..	242	727	Red rock (Reelsville)	10	1055
Sand (water) (Pennsylvanian)	30	757	Shale, green (Sample) ...	5	1060
Black shale (Pennsylvanian)	10	767	Shale, dark (Sample)	5	1060
Sand (water) (Mississippian)	20	787	Shale, gray (Sample)	20	1085
White shale (Hardinsburg) ..	10	797	Limestone (Beaver Bend) ..	20	1105
Limestone (Golconda)	10	807	Shale, gray (Mooretown) ..	25	1130
Sand (Golconda)	30	837	Sand, hard (Mooretown) ..	1	1131
			Red rock (Mooretown)	4	1135
			Shale, sandy (Mooretown) ..	15	1150
			Shale, gray (Paoli)	40	1190
			Limestone, brown (Paoli) ..	8	1198
			Shale, gray (Paoli)	47	1245
			Sand and sulphur water ...		1245
			Total depth		1245

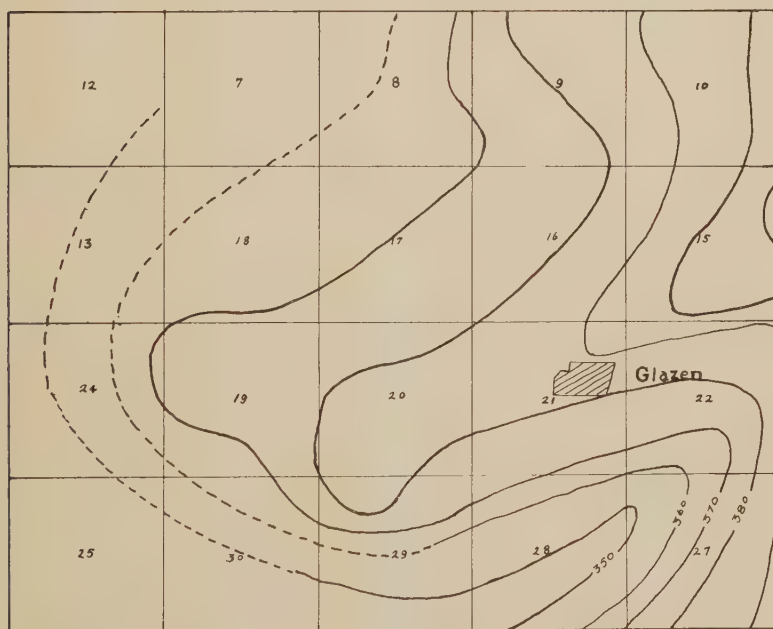


Fig. 9. Diagram of Glezen terrace. Contours drawn on Coal V. After Malott in "Petroleum and Natural Gas in Indiana."

Madison Township—There are two fields located in this township, the Bowman and the Davidson. These are located in the central and western parts of the township.

Geological Conditions—The following is a general section presenting the stratigraphy as revealed in well records:

Surface sands and clay.....	from 40 to 70 feet
Pennsylvania strata	700 feet
Mississippian (Chester) strata.....	500 feet

Bowman Field—This field lies about three miles west of Petersburg and immediately south of the Bowman post office. There appear to be

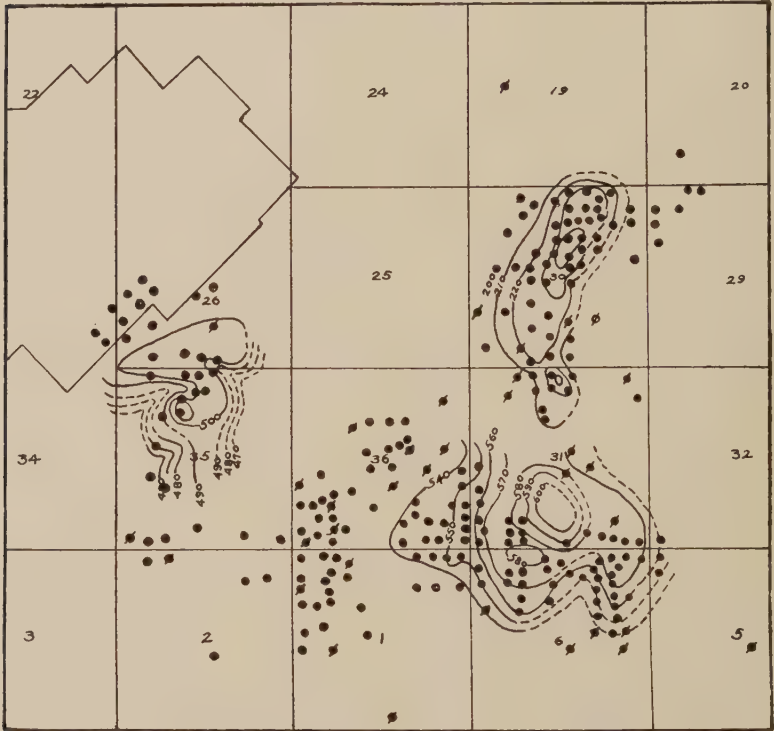


Fig. 10. Diagram showing structural conditions in the Bowman field. Contours on the oil sand. Data secured by H. L. Barnett and W. P. Rawles.

at least three pools in this field separated from each other by narrow strips of unproductive territory.

Bowman Pool—The Bowman pool lies south of the post office of that name. The main part of the pool being in section 30 but extending into the northwest corner of section 29 and into the northern part of section 31 in T. 1 N., R. 8 W.

Oil is present in two sands in this pool, one in the Cypress formation and the other in the Mooretown. The upper sand occurs at about 950 feet below the surface and the lower one at about 1,250 feet. The oils occur in the Chester division of the Mississippian. The subdivisions of the Chester have, for the most part, their normal thicknesses and char-

acteristics. The lowermost as recorded in the well logs is the Mooretown. The Beaver Bend limestone lying above has a thickness of 25 feet and the Sample sandstone 25 feet, the Reelsville and Elwren 35 feet, are normal thicknesses. The formations above these are abnormally thick in some logs, though some of these may not have been accurately reported. The following are the surface elevations, depths to sands and thicknesses of the sands in some of the wells:

Lease	Surface Elevation		Depth to Oil Sand	Thickness of Oil Sand
E. Shouse Well No. 1.....	487 feet		1273 feet	2 feet
E. Shouse Well No. 2.....	481 feet		1254 feet	2 feet
E. Shouse Well No. 2.....	481 feet	second	1263 feet	2 feet
E. Shouse Well No. 3.....	478 feet		1082 feet	4 feet
J. C. Brady Well No. 1.....	510 feet		1287 feet	10 feet
J. C. Brady Well No. 2.....	530 feet		1314 feet	13 feet
J. C. Brady Well No. 3.....	501 feet		1253 feet	2 feet
J. C. Brady Well No. 3.....	501 feet	second	1287 feet	3 feet
J. C. Brady Well No. 4.....	499 feet		1274 feet	4 feet
J. C. Brady Well No. 5.....	486 feet		1263 feet	4 feet
J. C. Brady Well No. 6.....	486 feet		1271 feet	5 feet
J. C. Brady Well No. 7.....	481 feet		1270 feet	6 feet
J. P. Gladish Well No. 1.....	438 feet		1228 feet	5 feet
J. P. Gladish Well No. 2.....	440 feet		1232 feet	2 feet
J. R. Beck Well No. 2.....	515 feet		1288 feet	12 feet
M. Fowler Well No. 1.....	514 feet		1271 feet	5 feet

The following are the logs of some of the wells in this pool:

J. C. BRADY WELL No. 4, SECTION 30.

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Clay, yellow	25	25	Sand, hard (Tar Springs) .	75	850
Clay, blue	20	45	Slate (Glen Dean).....	10	860
Sand, white	135	180	Shell, hard (Glen Dean)...	5	865
Slate	20	200	Slate (Hardinsburg)	35	900
Slate, black	15	215	Slate, black	10	910
Sand, white	85	300	Sand, hard	15	925
Slate, white	45	345	Limestone (Golconda)....	15	940
Coal IV	5	350	Sandstone (Indian		
Slate, white	45	395	Springs)	10	950
Shell	95	400	Oil sand (Cypress).....	25	975
Slate, white	25	425	Sand	65	1040
Shell	10	435	Blue limestone (Beech		
Limestone (Minshall)....	10	455	Creek)	75	1115
Slate	25	475	Slate (Elwren)	10	1125
Slate, brown	85	560	Shell (Reelsville)	25	1150
Shell	10	570	Sand (Sample)	25	1175
Sand-water (Mansfield)....	5	575	Limestone (Beaver Bend)..	25	1200
Sand, hard	25	600	Slate (Mooretown)	55	1255
Shell	25	625	Oil sand (Mooretown)....	3	1258
Sand	100	725	Brown shell (Mooretown) .	16	1274
Sand-water	25	750	Brown sand (Mooretown) .	4	1278
Slate	25	775			

The initial production was eight barrels per day.

LOG OF WELL No. 8 ON THE ALEX WILLIS FARM, SECTION 6. DRY HOLE.

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Quicksand	40	40	Slate, black	35	600
Mud	15	55	Mud	10	610
Shell	40	95	Slate	70	680
Slate	5	100	Sandstone (Mansfield)	60	740
Sand and shell	56	156	Slate (Tar Springs)	70	810
Slate, white	4	160	Limestone (Glen Dean) ...	43	853
Slate, black	40	200	Slate	2	855
Sand	20	220	Sand (Hardinsburg)	37	892
Slate, black	60	280	Slate (Hardinsburg)	12	904
Shell	10	290	Lime shell (Golconda)	34	938
Slate, white	2	292	Limestone, broken	6	944
Mud	38	330	Sand (Cypress)	11	955
Shell	17	347	Slate	85	1040
Slate	3	350	Lime (Beech Creek)	8	1048
Slate, black	40	390	Slate, Elwren	33	1081
Mud	20	410	Sand, oil	3	1097
Slate, white	70	480			to
Sandstone	40	520			1100
Slate, white	15	535			

LOG OF WELL No. 5 ON THE S. A. D. BAKER FARM, SECTION 31.

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Clay, yellow, soft	15	15	Slate, light, soft	3	565
Gravel, yellow, soft	15	30	Sand, light, sharp	20	585
Sand, light, soft	10	40	7 bailers water.		
Slate, dark, soft	20	60	Slate, dark, soft	15	600
Lime, light, hard	5	65	Shale, light, sandy	30	630
Slate, dark, soft	35	100	Slate, light, soft	10	640
3 bailers water.			Shale, light, sandy	40	680
Lime, sandy, light, soft....	11	111	Slate, light, soft	20	700
Coal V, black, soft	3	114	Slate, dark, soft	25	725
3 bailers at 115 feet.			Sand, light, soft (Mans- field)	50	775
Slate, light, soft	8	122	Slate, light, soft	10	785
Lime, sandy, light, soft ..	15	137	Sand, light, sharp (Tar Springs)	30	815
Slate, brown, soft	53	190	Slate, dark, soft	61	876
Sand, broken, grey, soft...	30	220	8¼-inch casing, 861 feet.		
Slate, light, soft	8	228	Slate, light, soft (Hardins- burg)	14	890
10-inch casing set of 230 feet, cable measurements.			Sand, light, sharp	15	905
Lime, light, hard	30	258	Slate, dark, soft	5	910
Slate, dark, soft	42	300	Lime, light, hard	10	920
Shale, light, soft	30	330	Slate, dark, soft (Golconda)	10	930
Slate, dark, soft	5	335	Lime, light, hard	10	940
Slate, light, soft	10	345	Sand, light, sharp (Cy- press)	55	995
Shale, light, soft	15	360	Hole full water, 960 feet.		
Shale, dark, soft	35	395	Slate, dark, soft (Cypress)	8	1003
Slate, light, soft	25	420	Lime, grey, hard (Cypress)	3	1006
Lime, light, hard	5	425	Slate, dark, soft (Cypress)	37	1043
Slate, dark, soft	5	430	6¼-inch casing, 1043 feet.		
Slate, light, soft	30	460	Lime, shell, light, hard ..	8	1051
Shale, light, soft	65	525			
Slate, light, soft	25	550			
Lime, grey, hard	12	562			

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Slate, dark, soft	10	1061	Broken sand, light, soft...	10	1123
Hole reamed and 6¼-inch casing set in lime, 1065 feet.			Slate, dark, soft (Elwren)	2	1125
Little lime, light, hard (Beech Creek)	42	1103	Light show of oil.		
Slate, dark, soft	10	1113	Sand, brown, soft.....	2	1127
			Sand, light, medium	4	1131
			Lime, light, hard (Reelsville)	4	1135

Total depth, 1135 feet. Top sand, 1125 feet—light show oil.

Barker Pool—This pool lies south and southwest of the Bowman pool. It is a part of the same general structure. It lies chiefly in the south part of section 31, T. 1 N., R. 8 W. and the north part of section 6, T. 1 S., R. 8 W., but also extends into the northeast corner of section 1, T. 1 S., R. 9 W. and into the southeast corner of section 36, T. 1 N., R. 9 W.

The stratigraphical conditions are similar to those in the Bowman pool. Two oil sands occur, one in the Hardinsburg and one in the Elwren.

The following table gives the surface elevation, the depth to oil sands and the thickness of the oil sands of some of the wells drilled in section 6 of the Barker pool:

Lease	Surface Elevation	Depth to Oil Sand	Thick- ness of Oil Sand
W. H. Gladish Well No. 1	497 feet	916 feet	26 feet
W. H. Gladish Well No. 2	490 feet	913 feet	14 feet
W. H. Gladish Well No. 3	471 feet	895 feet	18 feet
W. H. Gladish Well No. 4	463 feet	1090 feet	6 feet
W. H. Gladish Well No. 5	508 feet	946 feet	28 feet
W. H. Gladish Well No. 6	490 feet	932 feet	23 feet
W. H. Gladish Well No. 7	492 feet	885 feet	5 feet
W. H. Gladish Well No. 8	472 feet	872 feet	8 feet
W. H. Gladish Well No. 9	487 feet	1108 feet	4 feet
W. H. Gladish Well No. 10	488 feet	1141 feet	Dry
W. H. Gladish Well No. 11	460 feet	860 feet	26 feet
W. H. Gladish Well No. 11	460 feet	Second 1073 feet	5 feet

Rumble or Snyder Pool—This pool lies west of the Barker pool, mainly in the central part of section 36, T. 1 N., R. 9 W. and in the northwestern part of section 1, T. 1 S., R. 9 W. A few wells are located in the northeastern part of section 2, T. 1 S., R. 9 W., and in the southeastern part of section 35, T. 1 N., R. 9 W.

The following table gives the surface elevation, the depth to the oil sands, and thickness of the sands of some of the wells in section 35:

Lease	Surface Elevation	Depth to Sand	Thickness of Sand
M. F. Snyder Well No. 1	502 feet	984 feet	14 feet
M. F. Snyder Well No. 1	502 feet	1284 feet	7 feet
M. F. Snyder Well No. 1	502 feet	1305 feet	6 feet
M. F. Snyder Well No. 2	495 feet	1292 feet	13 feet

M. F. Snyder Well No. 3	489 feet	1334 feet	3 feet
M. F. Snyder Well No. 4		1335 feet	Dry
M. F. Snyder Well No. 5	511 feet	1313 feet	21 feet
M. F. Snyder Well No. 6		1393 feet	Dry
M. F. Snyder Well No. 7		1347 feet	Dry
M. F. Snyder Well No. 8	494 feet	1345 feet	2 feet
M. F. Snyder Well No. 9		1348 feet	Dry

The following are the logs of some of the wells drilled in this pool:

LOG OF M. F. SNYDER WELL No. 7, LOCATED IN SECTION 2,
MADISON TOWNSHIP.

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Clay, yellow		10	Slate, gray	10	590
Slate, gray	20	30	Slate, brown	35	625
Sand	17	47	Sand	10	635
Slate, gray	38	85	Sand	40	675
Sand	8	93	Slate, brown	25	700
Slate, gray	2	95	Slate, gray	35	735
Coal	2	97	Slate, brown	35	790
Lime	6	103	Sand	30	820
Slate, gray	32	135	Slate, brown	12	832
Slate, brown	15	150	Sand	6	838
Slate, gray	5	170	Slate, gray	4	842
Lime	15	165	Sand	27	869
Sand	10	180	Coal	3	872
Slate, brown	5	185	Slate, gray	3	875
Sand	25	210	Sand	55	930
Slate, gray	30	240	Sand	35	965
Sand	25	265	Slate, gray	29	994
Slate, brown	3	268	Lime	3	997
Coal	4	272	Slate, gray	13	1010
Lime	5	277	Lime	23	1033
Coal	3	280	Slate, brown	22	1055
Slate, gray	15	295	Sand	23	1078
Lime	15	310	Slate, gray	82	1160
Sand	52	362	Lime	18	1178
Slate, brown	10	372	Slate, gray	10	1188
Slate, gray	8	380	Sand	4	1192
Sand	4	384	Lime	20	1212
Slate, gray	21	405	Slate, gray	5	1217
Slate, brown	2	407	Sand	15	1232
Lime	35	442	Slate, gray	5	1237
Slate, gray	18	460	Lime	8	1245
Slate, brown	3	463	Slate, gray	25	1260
Coal	4	467	Lime	10	1270
Slate, gray	16	483	Slate, brown	10	1280
Lime	2	485	Red rock	3	1283
Slate, brown	10	495	Slate, gray	15	1298
Lime	18	513	Sand	9	1307
Slate, gray	12	525	Slate, gray	5	1312
Slate, brown	3	528	Sand	15	1327
Coal	2	530	Lime, brown	8	1335
Slate, brown	28	558	Slate, gray	5	1340
Lime	2	560	Sand	5	1345
Slate, brown	20	580	Oil sand	2	1347

Total depth, 1347 feet.

LOG OF WELL No. 5 ON THE J. T. RUMBLE FARM, MADISON TOWNSHIP.

Estate of Michael Murphy (deceased) Oil Company.
Finished July 7, 1919. Dry.

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Surface	80	80	Water sand	20	940
Lime shell	5	85	Slate, dark	110	1050
Coal	3	88	Lime cave	25	1075
Sandy lime	22	110	Water sand	35	1110
Slate	20	130	Limestone	20	1130
Lime	15	145	Shale, dark	30	1160
Coal-water	5	150	Sandstone (Cypress)	20	1180
Slate, white	60	210	Limestone, little	20	1200
Lime, sandy	115	325	Shale (Beech Creek)	20	1220
Slate, dark	95	420	Limestone and sandstone..	30	1250
Lime	5	425	Shale, dark	20	1270
Slate, white	35	460	Limestone, (Big)	22	1292
Lime	10	470	Shale (Beaver Bend)	10	1302
Lime, broken	80	550	Red rock	8	1310
Slate, white	75	625	Shale	12	1322
Slate, dark	90	715	Oil sand	10	1332
Sand	35	750	Limestone	13	1345
Slate	90	840	Sandstone and limestone..	39	1384
Lime, sandy	80	920			

Water at 150 and 750 feet. Water, 2 barrels per hour, 325 feet.
Salt water at 940 feet. Snyder sand, dry, at 1332 feet. Oakland City
sand at 1345 feet. Water, brown, at 1384 feet.

Casing Record—12½-inch, 21 feet; 10-inch, 150 feet; 8¼-inch, 840
feet; 8¼-inch, 1265 feet.

LOG OF WELL No. 1 ON THE F. P. ROBLING FARM.

(200 feet to south line, 200 feet to west line, section 35)

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Soil		1	Shale, light	45	563
Clay	10	11	Shale, dark	35	598
Sandstone, white	40	51	Coal	2	600
Shale, blue	39	90	Shale, light	45	645
Limestone, white	10	100	Sandstone, light	10	655
Shale, blue	40	140	Shale, dark	10	660
Shale, black	30	170	Limestone, brown	5	665
Shale, gray	20	190	Sandstone, light	10	675
Sandstone, white	10	200	Shale, dark	5	780
Coal	2	202	Sandstone, gray	17	797
Fire clay	8	210	Shale, gray	18	815
Shale, gray	45	255	Sandstone, white	75	890
Sandstone, white	70	325	Limestone, dark	7	897
Shale, gray	5	330	Shale, dark	63	960
Sandstone, white	25	355	Shale, white	2	962
Shale, black	20	375	Sandstone, brown	5	967
Sandstone, white	15	390	Sand, gray	10	977
Shale, white	5	395	Sandstone, brown	15	992
Limestone, white	35	430	Shale, dark	14	1006
Shale, black	20	450	Sandstone, gray	16	1022
Shale, light	65	515	Sandstone, light	6	1028
Coal	3	518	Sandstone, light (Cypress)	91	119

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Limestone, dark	12	1131	Shale, dark	37	1270
Mud, blue (Beech Creek) ..	3	1134	Sandstone, dark	15	1285
Sandstone, dark	13	1147	Sandstone, dark	7	1292
Limestone, dark	5	1152	Limestone, dark	2	1294
Sandstone, white	15	1167	Limestone, light	3	1297
Limestone, brown	9	1176	Shale, black	5	1302
Red rock	3	1179	Sandstone, light	2	1304
Sandstone, dark	12	1191	Shale, dark	9	1313
Shale, dark	6	1197	Limestone, dark	3	1316
Limestone, white (Beaver Bend)	36	1233	Sandstone, gray	16	1322
			Top of pay		1316

Gas at 675 feet. Oil at 967 feet. Best pay at 992 feet. Show of oil at 1285 feet.

LOG OF WELL No. 2 ON THE F. P. ROBLING FARM.

(333 feet to west line, 200 feet to north line, section 35)

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Soil, black		1	Slate, light	18	1021
Clay, yellow	6	6	Sandstone, gray	8	1029
Mud, brown	94	100	Slate, dark	6	1035
Coal	4	104	Limestone, gray	4	1039
Limestone, gray	5	109	Same (Cypress)	15	1054
Mud, blue	20	129	Limestone, dark	5	1059
Shale, gray	60	189	Sandstone, white (Cypress)	98	1149
Mud, blue	15	204	Limestone, gray (Beech Creek)	5	1169
Limestone, gray	4	208	Limestone, gray	8	1177
Mud, white	45	253	Shale, blue	4	1181
Shale, brown	100	353	Limestone, gray	4	1185
Shale, white	50	403	Shale, blue	5	1190
Limestone, white	2	445	Limestone, gray	12	1202
Mud, brown	42	545	Shale, blue	6	1208
Limestone, gray	5	550	Limestone, gray	12	1220
Mud, white	90	640	Shale, blue	17	1237
Limestone, white	8	648	Limestone, white (Beaver Bend), top of big lime..	3	1240
Mud, gray	30	678	Limestone, dark	5	1240
Shale, brown	75	703	Limestone, white	5	1250
Limestone, shell, g.	7	710	Limestone, dark, gr.	25	1275
Mud, white	25	735	Red rock	5	1280
Shale, brown	20	755	Shale, dark	12	1292
Sandy shell, wh.	5	760	Limestone, gray	10	1302
Slate, gray	50	810	Limestone, dark	15	1317
Shale, brown	75	885	Limestone, black	6	1323
Shale, blue	8	893	Shell, brown	3	1326
Sandstone, white	10	903	Shale, dark	4	1330
Slate, blue	6	909	Sandstone, gray	5	1335
Sandstone, white	15	926	Shale, dark	8	1343
Limestone, gray	2	928	Sandstone, gray	5	1348
Sandstone, gray	15	943	Top of pay sand		1343
Slate, black	7	950			
Lime, gray	2	952			
Slate, dark	51	1003			

Sand, dry, at 1029 feet.

LOG OF WELL No. 3 ON THE F. P. ROBLING FARM.

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Soil		1	Shale, dark	40	790
Clay, yellow	5	6	Shale, brown	60	850
Shale, dark	94	100	Shale, light	40	890
Coal	4	104	Sandstone, white	33	923
Limestone, gray	5	109	Shale, light	3	926
Shale, dark	25	134	Sand, white	5	931
Limestone, white	20	154	Shale, dark	22	953
Shale, dark	55	209	Limestone, brown	5	958
Limestone, gray	4	213	Shale, dark	57	1015
Shale, light	45	258	Sandstone, brown	15	1030
Shale, dark	50	308	Shale, dark	15	1045
Sandstone, gray	15	323	Shale, dark	5	1050
Shale, light	20	343	Limestone, brown	5	1055
Limestone, dark	10	353	Sandstone, light	10	1160
Shale, dark	40	393	Limestone, gray	8	1168
Shale, black	5	398	Shale, dark	5	1173
Shale, light	27	435	Limestone, white	7	1180
Limestone, gray	15	450	Shale, dark	5	1185
Shale, light	15	465	Limestone, gray	20	1205
Shale, gray	20	485	Shale, light	7	1212
Shale, light	10	495	Limestone, white	4	1216
Limestone, gray	5	500	Shale, dark	4	1220
Shale, light	5	505	Limestone, white	3	1223
Limestone, white	20	525	Shale, dark	11	1234
Shale, light	15	540	Limestone, brown	25	1259
Coal	5	545	Shale, light	20	1279
Shale, dark	15	560	Mud, light	10	1289
Limestone, brown	5	565	Lime, dark	16	1305
Shale, dark	30	595	Shale, dark	20	1315
Shale, light	50	645	Sandstone, dark	5	1320
Limestone, brown	5	650	Limestone, dark	7	1327
Shale, dark	50	700	Shale, dark	13	1340
Sand, white	15	715	Lime, gray	2	1342
Shale, dark	5	720	Sandstone, gray	4	1346
Limestone, white	30	750	Pay sand	1342-1346	

8¼-inch casing set at 635 feet; hole full of water at 923 feet; hole full of water at 1060 feet.

LOG OF WELL No. 4 ON THE BURKHART FARM, SECTION 35.

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Soil		8	Limestone	5	340
Mud	8	16	Shale	45	385
Sand	12	28	Limestone, sandy	20	405
Water sand	12	40	Shale, white	5	410
Shale	30	70	Shale, black	25	435
Shale, black	20	90	Shale, white	5	440
Coal	5	95	Limestone	5	445
Limestone	10	105	Shale, black	5	450
Shale	5	110	Limestone	5	465
Mud	80	190	Shale, white	10	460
Shale	30	220	Shale, black	25	480
Coal	7	227	Shale, white	80	560
Shale	53	280	Shale, black	20	580
Sandstone	5	305	Limestone	5	585
Sandstone	30	335	Shale, white	40	615

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Water sand	35	650	Limestone, sandy	10	880
Shale, black	30	680	Water sand	20	900
Water sand	25	705	Shale, black	20	920
Shale, black	30	735	Shale, white	10	930
Shale, white	15	750	Shale, black	45	975
Shale, black	25	775	Limestone (Siberia)	4	979
Sandstone	15	790	Oil sand (Tar Springs)...	28	1007
Shale, black	30	820	Total depth	17	1024
Sandstone	50	870			

Davidson Pool—The Davidson pool is located largely in section 35 and in section 36, T. 1 N., R. 9 W. The larger part of the pool is in Madison township but a small part is in Clay township.

Monroe Township—This township contains the Oakland City pool which was opened in 1907. The first well, drilled near Arthur, was a ten barrel well. A well on the Yeager lease drilled the next year had an initial production of 30 barrels and a high gas pressure. Gas was piped from this pool to Oakland City in 1919. The capacity of the gas wells varied from two million to six million cubic feet. Some of the best oil wells had an initial production of from 50 to 100 barrels per day.

The general stratigraphical conditions are:

Surface clays from 15 to 80 feet
 Coal Measures, shales, coal, sandstone..... 700 feet
 Chester sandstones, limestones and shales..... 450 feet

Oils occur in the lower Chester, the Mooretown and the Paoli formations. The oil sands are called the Brown sand and the Oakland City sand. The following are the records of some of the wells recently drilled in Monroe township:

WELL No. 1 ON THE LOUISA FARIS LEASE.

(Oakland City Pool, Section 26, drilled by the Consolidated Oil and Development Co. Completed August 13, 1923)

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Clay, yellow, soft	15	15	Slate, dark, soft	135	514
Muck, blue	53	68	Sand, light, hard	46	560
Quick sand, dark	14	82	Slate, dark, soft	20	580
Coal V at 90 feet, slate, dark	71	153	Slate, sandy	54	634
Sand, light	22	175	Sand, light, hard	31	665
Slate, dark	2	177	Sand, soft, (Mansfield)...	65	730
Coal IV	4	181	Slate, dark	2	732
Slate, light	24	205	Sand, light, medium	10	742
Slate, dark	22	227	Slate, dark, soft	10	752
Slate, light	15	242	Sand, light	22	774
Slate, dark	18	260	Slate, dark	68	842
Lime, light, broken	5	265	Sand, broken (Hardins- burg) soft	8	850
Slate, soft	33	298	Sand, light	16	866
Lime, hard	8	306	Sand, hard	50	916
Slate, dark, soft	4	310	Slate, dark, soft (Golconda)	36	952
Lime, light	1	311	Sand, light (Cypress)....	28	980
Slate	16	327	Slate, dark	12	992
Lime, hard	2	329	Lime, hard (Beech Creek)..	13	1005

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Slate, soft	5	1010	Lime, hard (Beaver Bend)	37	1105
Sand, light, hard (Elwren)	5	1015	Slate, soft	1	1106
Slate, dark, soft	8	1023	Lime, light, hard	1	1107
Sand, broken	7	1030	Slate, dark, soft (Moore-		
Lime, light, hard (Reels-			town)	50	1157
ville)	3	1035	Sandy lime, hard (Paoli) ..	3	1160
Slate, dark, soft (Sample)	13	1048	Sandy lime, brown, soft...	6	1166
Slate, red	2	1050	Sandy lime	2	1168
Slate, dark	3	1053	Shell, hard	2	1170
Slate, red	2	1055	Sandy lime, soft (Oakland		
Slate, dark	13	1068	City)	16	1186

Best showing, 1173 to 1179 feet. Plugged back to 1183 feet. Show of oil at 1160 feet. Water and gas at 150 feet. Water to drill at 560 and 730 feet.

Casing Record—12½-inch casing, 98 feet 5 inches; 10-inch casing, 293 feet; 8¼-inch casing, 786 feet; 6½-inch casing, 1073 feet; 5⅝-inch casing, 113 feet.

LINDSEY HEIRS WELL No. 1.

(Section 22, Range 8 West, Oakland City Pool)

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Clay, light, soft	61	61	Slate, dark, soft (Golconda)	15	844
Sand, light, medium	51	112	Lime, light, hard (Gol-		
Slate, dark, soft	25	137	conda)	2	846
Lime, dark, soft	2	139	Slate, light, soft	5	851
Coal V	3	142	Lime, light, broken	4	855
Shale, dark, soft	98	240	Sand, light	7	862
Coal IV	4	244	Sand, light, soft	24	886
Slate, dark, soft	16	260	Slate, light, soft	10	896
Lime, light, hard	1	261	Sand, light, hard	16	912
Slate, dark, soft	151	412	Sand, light, soft (Cypress)	59	971
Lime, light, medium	8	420	Slate, light, soft	17	988
Slate, dark, soft	78	498	Lime, light, hard	1	989
Slate, light, soft	14	512	Sand, light, broken	8	997
Sand, light, soft	13	525	Slate, dark, soft	11	1008
Slate, dark, soft	5	530	Lime, dark, hard (Beech		
Lime, light, hard	23	553	Creek)	18	1026
Sand, light, hard	45	598	Slate, light, soft	7	1033
Slate, dark, soft	20	618	Sand, light, hard (Sam-		
Sand, dark, broken	42	660	ple)	78	1111
Slate, dark, soft	30	690	Sand, light, broken	4	1115
Slate, light, soft	17	707	Lime, light, hard (Beaver		
Slate, dark, soft	13	720	Bend)	20	1135
Sand, light, soft (Mans-			Slate, blue, soft	3	1138
field)	32	752	Lime, light, hard (Moore-		
Slate, dark, hard	1	753	town)	3	1141
Sand, dark, hard (Hardins-			Slate, dark, soft	4	1145
burg)	11	764	Sand, dark, soft	12	1157
Slate, dark, soft	36	800	Slate, dark, soft	9	1166
Lime, light, medium	14	814	Sand, light, hard (Paoli) ..	3	1169
Slate, light, soft	5	819	Sand, light, soft	2	1171
Lime, light, medium (Gol-			Light showing of oil.....	1169	to 1171
conda)	10	829	Sand, light, hard	19	1190

Total depth, 1190 feet.

Hole filled with salt water at 1190 feet.

Casing Record—10-inch pipe, 61 feet; 8¼-inch pipe, 530 feet; 6½-inch pipe, 1111 feet.

WELL No. 1 ON THE SIM BURNETT FARM.

(Oakland City Pool, Section 27, Monroe Township, southeast of Arthur.
 Drilled by the Consolidated Oil and Development Co.
 Completed October 10, 1923)

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Clay, light, soft	10	10	Slate, dark, soft	51	819
Mud, dark, soft	43	53	Sand, light, hard	39	858
Sandy shale, dark, soft....	12	65	Sand, dark, hard	44	902
Slate, dark, soft	25	90	Hole full of water at		902
Slate, dark, soft	12	102	Sand, light, soft (Cypress)	92	997
Slate, dark, soft	43	145	Slate, dark, soft	1	998
Sand, light, hard	3	148	Lime, light, hard (Beech		
Coal IV, dark, soft	3	151	Creek)	13	1011
Lime, light, hard	1	152	Slate, dark, soft	12	1023
Slate, dark, soft	13	165	Sand, light, hard (Elwren)	5	1028
Slate, light, soft	22	187	Slate, dark, soft	9	1037
Slate, dark, soft	27	214	Lime, dark, hard (Reels-		
Lime, light, hard	2	216	ville)	2	1039
Slate, light, soft	7	223	Slate, dark, soft (Sample)	39	1078
Slate, dark, shelly	32	255	Lime, light, hard (Beaver		
Lime, light, hard	2	257	Bend)	36	1114
Slate, light, shelly	20	277	Slate, dark, soft (Moore-		
Lime, light, hard	7	284	town)	28	1142
Slate, light, soft	16	300	Show of red rock at		1123
Lime, light, hard	1	301	Lime, light, hard (Paoli) ..	4	1146
Slate, light, soft	11	312	Sand, black, soft	12	1158
Slate, dark, muddy	25	337	Oil showing at		1151
Slate, dark, soft	97	434	Sand, black, hard	1½	1159½
Slate, light, shelly	16	450	Sand, black, soft	4	1163½
Slate, dark, soft	38	488	Sand, gray, hard	3½	1167
Sand, light, hard	42	530	Sand, gray, hard	41	1208
Slate, dark, soft	15	545	Lime shell, black, hard) ...	7	1215
Sand, light, soft	52	597	Slate, dark, soft	13	1228
Slate, dark, soft	18	615	Sand, gray, hard	17	1245
Sand, gray, broken	25	640	Sand, gray, broken	5	1250
Sand, light, hard (Mans-			Sand, light, hard	27½	1277½
field)	128	768	Filled with "blue lick" at		1265

Casing Record—12½-inch pipe, 98 feet; 10-inch pipe, 340 feet; 8¼-inch pipe, 865 feet; 6⅝-inch pipe, 1080 feet; 5⅞-inch pipe, 1213 feet.

Logan Township—This township contains, near its western border, one of the largest pools of the county. There are several oil bearing sands encountered. Two of these have been very productive.

Oatsville Field—This field is located in Logan township, the wells being principally in sections 14, 23, 22 and 27, the crest of the structure lying three-fourths of a mile east of the village of Oatsville.

Geological Conditions—The general stratigraphical conditions in the Oatsville pool as revealed by well logs are as follows:

Surface clay	from 15 to 70 feet
Pennsylvanian strata	800 feet
Mississippian strata (Chester).....	400 feet

The oil in section 27 is obtained from the Sample formation of the Chester which occurs at depths between 1,250 and 1,270 feet in the J. Shafer Heirs No. 6.

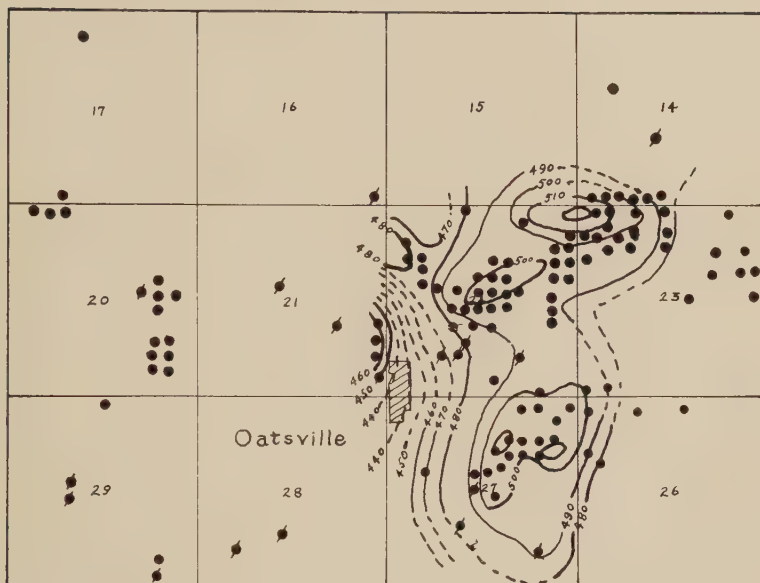


Fig. 11. Diagram showing possible structural conditions in Oatsville field. Contours drawn on oil sand.

The following are the records of three wells drilled in section 27:

LOG OF WELL No. 4 ON THE J. SHAFER HEIRS FARM, SECTION 27.

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Surface, yellow, soft	50	50	Shale, dark, soft	52	1006
Shale, dark, soft	20	70	Sandstone, dark, hard		
Sandstone, light, medium	88	158	(Hardinsburg)	14	1020
Limestone, light, hard	2	160	Sandstone, light, soft	60	1080
Shale, dark, soft	12	172	Sandstone, light, hard	9	1089
Coal V, dark, soft	7	179	Shale, dark, soft	14	1103
Shale, dark, soft	37	216	Limestone, dark, hard (Golconda)	21	1124
Shale, light, soft	30	246	Shale, dark, soft (Indian Springs)	25	1149
Shale, dark, soft	86	332	Shale, dark, shelly	9	1158
Sandstone, light, soft	6	338	Sandstone, light, hard (Cypress)	33	1191
Shale, dark, soft	147	485	Shale, soft, dark	2	1193
Limestone, light, hard	6	491	Limestone, light, hard	2	1195
Shale, dark, soft	43	534	Limestone, light, soft	4	1199
Limestone, light, soft	20	554	Limestone, light, hard (Beech Creek)	22	1221
Shale, dark, soft	9	563	Shale, dark, soft	6	1227
Shale, dark, gritty	119	682	Limestone, light, hard (Reelsville)	3	1230
Sandstone, dark, soft	28	710	Shale, dark, soft	20	1250
Shale, dark, soft	5	715	Sandstone, light, hard		
Sandstone, dark, soft	23	738	(Sample)	7	1259
Shale, dark, soft	32	770	Oil sand, brown, soft	14	1271
Sandstone, light, hard	5	775	Sand, light, hard	2	1273
Shale, dark, soft	25	800			
Sandstone, light, soft (Mansfield)	58	858			
Shale, dark, shelly	22	880			
Shale, dark, soft	68	948			
Sandstone, light, hard	6	954			

Total depth, 1273 feet. Water at 1020 feet.

Casing Record—12½-inch casing, 70 feet 5 inches; 10-inch casing, 304 feet; 8¼-inch casing, 870 feet; 6⅝-inch casing, 1204 feet 6 inches.

Drilled by Nelson Bros., Princeton, Ind. Completed March 19, 1923.

LOG OF WELL No. 5 ON THE J. SHAFER HEIRS FARM, Section 27.

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Surface, yellow, soft	70	70	Shale, white, soft	5	874
Water.			Shale, dark	28	902
Sand, light	65	135	8¼-inch at 879.		
Shale, dark	5	140	Limestone, light, medium		
Shale, light, shelly	8	148	(Siberia)	8	910
Limestone, hard	1	149	Shale, dark, soft	17	927
Shale, dark, soft	2	151	Shale, light	19	946
Coal V	3	154	Shale, dark	14	960
Shale	15	169	Shale, sandy	42	1002
Sandstone, light	9	178	Sandstone, light, hard		
Water.			(Hardinsburg)	96	1098
Shale, dark	87	265	Water at 1012.		
Sandstone, light, broken ..	10	275	Shale, dark, soft	2	1100
Shale, dark, soft	47	322	Limestone, light, hard (Gol-		
10-inch at 303.			conda)	17	1117
Shale, light, shelly	12	334	Shale, dark, soft	13	1130
Shale, dark, soft	53	387	Sandstone, light, hard	5	1135
Lime, light, hard	3	390	Shale, soft	7	1142
Shale, shelly	38	428	Sandstone, hard (Cypress)..	63	1207
Lime, hard	2	430	Show oil at 1156 feet.		
Shale, dark, soft	43	473	Limestone (Beech Creek)..	18	1225
Limestone, light, hard	5	478	6⅝-inch at 1211 feet.		
Shale, dark, soft	38	516	Shale, dark, soft (Elwren)	7	1232
Sandstone, light, hard	31	547	Limestone, light, hard		
Water.			(Reelsville)	3	1235
Shale, dark, soft	48	595	Shale, dark, soft	19	1254
Shale, sandy, medium	112	707	Sandstone, light, hard	11	1265
Sandstone, light, hard	12	719	Sandstone, brown, soft		
Shale, dark, shelly	64	783	(Sample)	13	1278
Sandstone, light, hard	10	793	Sandstone, gray	2	1280
Sandstone, medium (Mans-			Total depth		1280
field)	76	869			

Drilled by Nelson Bros., Princeton, Ind. Completed April 9, 1923.

Casing Record—12½-inch casing, 70 feet 5 inches; 10-inch casing, 303 feet; 8¼-inch casing, 879 feet; 6⅝-inch casing, 1211 feet; 5⅜-inch liner, 87 feet.

LOG OF WELL No. 6 ON THE J. SHAFER HEIRS FARM, Section 27.

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Surface, yellow, soft	45	45	Shale	20	240
Shale, dark	15	60	Shale, dark	25	265
Sandstone, light	80	140	Sandstone, broken, medium	45	310
Water at 70 feet.			10-inch at 283 feet.		
Coal V, dark	6	146	Shale, dark soft	10	320
Shale	12	158	Sandstone, light	20	340
Sandstone, light, medium..	27	185	Little water.		
Shale, dark, soft	30	215	Shale, dark	20	360
Sandstone, light	5	220	Sandstone, light, medium..	20	380

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Shale, dark, soft	9	409	Sandstone (Hardinsburg), medium	61	1076
Limestone, light, hard	3	412	Shale, dark, soft	3	1079
Shale, dark, soft	3	415	Sandstone, light, hard	4	1083
Limestone, light, hard	2	417	Shale, dark, soft	5	1088
Shale, dark, soft	8	425	Shale, sandstone and shell	12	1100
Shale, light	25	450	Shale, light	3	1103
Shale, dark	35	485	Limestone (Golconda), hard	20	1123
Limestone, light, hard	6	491	Shale (Golconda), dark, soft	8	1131
Shale, dark, soft	14	505	Limestone (Golconda), gray, medium	4	1135
Shale, light	20	525	Shale (Indian Springs), dark, soft	15	1150
Sandstone	55	580	Limestone, brown, hard ..	7	1157
Shale, dark, shelly	145	725	Sandstone (Cypress), light	16	1173
Coal (Upper Block), soft..	5	730	Shale, dark, soft	3	1176
Water to drill.			Limestone (Beech Creek), light, hard	40	1216
Shale	20	750	6¾-inch at 1191 feet.		
Limestone, light, hard	2	752	Shale (Elwren), dark, soft	6	1222
Shale, dark, soft	36	788	Limestone (Reelsville), light, hard	3	1225
Sandstone (Mansfield), light, hard	32	820	Shale, dark, soft	19	1244
Water.			Sandstone (Sample), light, hard	6	1250
Sandstone (Mansfield), soft	35	855	Sandstone (Sample), dark, medium	5	1255
Shale, dark, soft	8	863	Oil.		
Shale, light	5	868	Sandstone (Sample), dark, soft	10	1265
8¼-inch casing at 868.			Best oil.		
Lime (Siberia), medium ..	3	871	Total depth		1265
Shale (Tar Springs), dark, soft	64	935			
Shale, light	15	950			
Shale, dark	56	1006			
Sandstone (Hardinsburg), light, hard	8	1015			
Water.					

Drilled by Nelson Bros., Princeton, Ind. Completed May 7, 1923.

Casing Record—12½-inch casing, 50 feet; 10-inch casing, 283 feet; 8¼-inch casing, 868 feet; 6⅞-inch casing, 1191 feet; 5⅝-inch liner, 85 feet.

In section 23 oil is found in the Mooretown formation of the Chester at a depth of about 1,300 feet. The following are the records of four wells drilled in the northwest quarter of section 23:

LOG OF WELL No. 1 ON THE WM. PHILLIPS FARM. (Elevation 463 feet)

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Clay, yellow, soft	25	25	Shale	11	260
Sand, gray, hard	16	41	Sandstone	19	279
Shale, white, hard	24	65	Shale, brown, soft	26	305
Coal VI, black, soft	5	70	Limestone, gray, hard....	5	310
Shale, blue, soft	77	147	Shale	50	360
Limestone, gray, hard	10	157	Limestone, white, hard ...	5	365
Shale, white, soft	13	170	Shale, dark, soft	49	414
Sandstone, white, soft	20	190	Limestone, gray, hard	8	422
Shale	55	245	Shale, dark, soft	11	435
Limestone	4	249	Limestone, gray, hard	4	439

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Shale, light, soft	11	450	Shale, dark, soft (Beech Creek)	3	1139
Limestone, gray, hard	5	455	Limestone, little	19	1158
Shale, light, soft	35	490	Shale, light, soft (Elwren)..	3	1161
Limestone, gray, hard.....	5	495	Sandstone, gray, soft	5	1166
Shale, blue, soft	125	520	Shale, shelly, light, soft ..	9	1175
Shale, light, soft	27	547	Sandstone, gray, soft, coarse	10	1185
Shale, dark, soft	61	608	Sandstone, white, soft, hard	10	1195
Sandstone, light, soft	24	632	Sandstone, water, white, soft (Sample)	35	1210
Limestone, light, hard	10	642	Hole full of water at 1200 feet.		
Shale, light, soft	23	665	Shale, dark, soft	5	1215
Sandstone, gray, hard	25	690	Sandstone, shell, gray, hard	5	1220
Shale, dark, soft	55	745	Shale, light, soft	5	1225
Limestone, gray, hard.....	5	750	Limestone, gray, hard (Beaver Bend)	2	1227
Shale, black, soft	5	755	Shale, green, soft (Beaver Bend)	3	1230
Sandstone, light, hard	15	770	6½-inch at 1241 feet.		
Shale, black, soft	55	825	Limestone, big, gray, hard (Beaver Bend)	35	1265
Sandstone, white, soft (Mansfield)	59	884	Shale, blue, soft	5	1270
Shale, dark, soft	12	895	Rock, red, soft (Moore-town)	3	1273
Limestone, gray, hard (Siberia)	4	900	Shale, dark, soft.....	17	1290
Shale, dark, soft (Tar Springs)	43	943	Sandstone, gray, soft	4	1294
Limestone, white, hard (Glen Dean)	10	953	Shale, green, soft	5	1299
Shale, white, soft (Glen Dean)	7	960	Sandstone, broken, soft ...	5	1304
Shale, dark, soft (Hardinsburg)	30	990	Sandstone, gray, soft	2	1306
Shale, light, soft	10	1000	First oil		1306
Broken sandstone, light, soft	15	1015			to
Sandstone, white, soft (Cypress)	100	1115			1317
Shale, dark, soft	3	1118	Total depth		1317
Sandstone, white, hard....	18	1136			

Production 25 barrels first 24 hours.

Levitt E. Gray, contractor. Completed May 27, 1922.

Casing Record—12½-inch, 62 feet 5 inches; 10-inch, 306 feet 8 inches; 8¼-inch, 989 feet 1 inch; 6⅝-inch, 1241 feet.

LOG OF WELL No. 2 ON THE WM. PHILLIPS FARM, SECTION 23.

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Clay, yellow, soft	20	20	Sandstone, white, soft	70	260
Shale, blue, soft	10	30	Limestone, gray, hard	4	264
Sandstone, gray, hard	15	45	280 feet 10-inch casing.		
Shale, white, soft	5	50	Coal, black, soft	2	266
Sandstone, gray, hard	8	58	Shale, light, soft	55	321
Coal, black, soft	2	60	Shale, brown, soft	50	371
64 feet 12½-inch casing.			Limestone, gray, hard	2	373
Shale, dark, soft	40	100	Shale, dark, soft	4	377
Sandstone, white, soft	15	115	Limestone, gray, hard	4	381
Shale, dark, soft	35	150	Shale, light, soft	30	411
Sandstone, gray, soft	20	170	Limestone, gray, hard	4	415
Coal, black, soft	5	175	Shale, dark, soft.....	10	425
Shale, dark, soft	15	190	Shale, light, soft	35	460

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Limestone, white, hard ...	10	470	Hole full of water at 1085 feet.		
Shale, dark, soft	30	500	Sandstone, white, soft	85	1135
Shale, light, soft	27	527	Sandstone, gray, hard (Cy- press)	19	1154
Limestone, gray, hard	5	532	Shale, light, soft	4	1158
Shale, dark, soft	38	570	Limestone, little, brown, hard (Beech Creek)	19	1177
Coal, black, soft	4	574	Shale, light, soft	3	1180
Shale, light, soft	16	590	Sandstone, gray, hard	10	1190
Sandstone, gray, soft	80	670	Shale, white, soft (Elwren)	4	1194
Shale, dark, soft	40	710	Sandstone, white, soft	20	1214
Shale, light, soft	80	790	Shale, white, soft (Reels- ville)	4	1218
Sandstone, light, soft	20	810	Sandstone, gray, hard (Sample)	16	1234
Shale, dark, soft	25	835	Shale, light, soft	14	1248
Sandstone, broken (Mans- field), white, soft	25	860	6 $\frac{3}{8}$ -inch casing at 1249.		
Hole full of water.			Limestone, gray, hard, big (Beaver Bend)	32	1280
Sandstone, white, soft (Mansfield)	40	900	Shale, dark, soft	5	1285
Shale, black, soft	4	904	Shale, light, soft	25	1310
Limestone, brown, hard (Siberia)	3	907	Shale, shelly, light, soft ..	8	1318
8 $\frac{1}{4}$ -inch casing at 905 feet.			Sandstone, broken, gray, hard (Mooretown)	32	1350
Shale, light, soft (Tar Springs)	18	925	No show of oil-water.		
Shale, dark, soft	35	960	Sandstone, gray, soft	5	1355
Limestone, gray, hard (Glen Dean)	8	968	Limestone, brown, hard ..	10	1365
Shale, dark, soft	57	1020	Shale, dark, soft (Paoli) ..	20	1385
Sandstone, broken, light, soft (Hardinsburg)	30	1050	Total depth, 1385 feet.		

Gray & Gray, contractors. Finished July 18, 1922.

LOG OF WELL No. 3 ON THE WM. PHILLIPS FARM.

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Clay, yellow, soft	25	25	Shale, light, soft	5	625
Sand, blue, soft	15	40	Sandstone, white, soft	35	665
Sand rock, gray, hard	36	76	Shale, dark, soft	32	697
Coal, black, soft	2	78	Shale, light, soft	53	750
Shale, light, soft	104	182	Shale, dark, soft	25	775
Coal, black, soft	6	188	Shale, light, soft	21	796
Shale, light, soft	7	195	Sandstone, white, soft	12	808
Sandstone, gray, soft	75	260	Shale, dark, soft	44	852
Sandstone, broken, gray, soft	10	270	Sandstone, white, soft (Mansfield)	57	919
Limestone, gray, hard	5	275	Shale, light, soft	3	922
Shale, light, soft	30	305	Limestone, white, hard (Si- beria)	3	925
Sandstone, light, soft	15	320	Shale, light, soft (Tar Springs)	15	940
Shale, gray, soft	45	365	Shale, dark, soft	20	960
Shale, dark, soft	10	375	Sandstone, gray, soft	15	975
Coal, black, soft	2	377	Shale, white, soft	15	990
Shale, light, soft	63	440	Sandstone, gray, soft	15	975
Limestone, gray, hard	10	450	Shale, white, soft	15	990
Shale, light, soft	75	525	Sandstone, gray, soft (Hardinsburg)	120	1130
Limestone, gray, hard	5	530	Shale, dark, soft	5	1135
Shale, dark, soft	40	570	Sandstone, gray, hard (Cy- press)	15	1150
Shale, light, soft	32	602			
Sandstone, white, soft	18	620			

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Shale, dark, soft	3	1153	Big lime, gray, hard (Beaver Bend)	8	1283
Little lime, brown, hard (Beech Creek)	21	1174	Shale, light, soft	17	1300
Shale, light, soft (Elwren) ..	26	1200	Sandstone, gray, hard	5	1305
Sandstone, gray, hard	27	1227	Top oil sand, brown, soft..	5	1310
Shale, light, soft (Sample) ..	21	1248	Oil sand, brown, soft (Mooretown)	5	1315
Big lime, gray, hard (Beaver Bend)	24	1272	Oil sand, brown, soft	4	1319
Big shale, light, soft (Beaver Bend)	3	1275	Oil sand, brown, soft	3	1322
			Oil sand, brown soft	3	1325
			Total depth, 1325 feet.		

Gray & Gray, Contractor. Completed August 14, 1922.

Casing Record—12½ inch, 63 feet 1 inch; 6⅝ inch, 1248 feet; 5⅜ inch, 85 feet 5 inches.

LOG OF WELL No. 4 ON THE WM. PHILLIPS FARM.

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Clay, yellow, soft	20	20	Limestone, gray, hard (Si- beria)	3	932
Sand, yellow, soft	5	25	Shale, light, soft (Tar Springs)	38	970
Sandstone, yellow, hard ..	55	80	Sandstone, gray, soft	25	995
Coal VI, black, soft	2	82	Shale, blue, soft	25	1020
Shale, blue, soft	118	200	Shale, black, soft (Hardins- burg)	10	1030
Sandstone, white, soft	70	270	Shale, light, soft	15	1045
10-in casing.			Sandstone, gray, soft	35	1080
Shale, light, soft	7	277	Shale, light, soft	10	1090
Set 277 feet.			Sandstone, white, soft (Cy- press)	72	1162
Limestone, gray, hard.....	4	281	Shale, light, soft	4	1166
Shale, light, soft	41	322	Little lime, brown, hard (Beech Creek)	21	1187
Shale, gray, soft	43	365	Shale, light, soft (Elwren) ..	15	1202
Shale, dark, soft	13	378	Sandy lime, gray, hard (Reelsville)	3	1205
Coal IV, black, soft	2	380	Shale, dark, soft	8	1213
Shale, light, soft	26	406	Sandstone, gray, hard (Sample)	23	1236
Limestone, gray, hard	3	409	Shale, dark, soft	9	1245
Shale, light, soft	48	457	Shale, light, soft	20	1265
Limestone, gray, hard	3	460	Limestone, gray, hard (Beaver Bend)	2	1267
Shale, light, soft	15	475	Shale, dark, soft (Beaver Bend)	2	1269
Limestone, gray, hard	5	480	Big lime, gray, hard (Beaver Bend)	23	1292
Sandstone, gray, soft	30	510	Shale, dark, soft	22	1314
Shale, light, soft	35	545	Sandstone, gray, hard (Mooretown)	5	1319
Limestone, light, hard	10	555	Sandstone, brown, soft ...	5	1324
Shale, light, soft	20	575	Sandstone, brown, soft ...	7	1331
Limestone, gray, hard	5	580	Sandstone, gray, hard	2	1333
Shale, dark, soft	44	625	First show of oil		1324
Sandstone, gray, soft	6	630	Best oil 1324-1331 feet.		
Shale, light, soft	6	636			
Sandstone, water, soft	44	680			
Shale, dark, soft	20	700			
Shale, light, soft	120	820			
Limestone, light, hard	8	828			
Shale, light, soft	31	859			
Sandstone, white, soft (Mansfield)	67	926			
Shale, light, soft	3	929			
8-inch casing at 929 feet.					

Gray & Gray, Contractor. Completed September 14, 1922.

Casing Record—12½-inch, 59 feet; 10-inch, 277 feet, pulled; 8¼-inch, 929 feet; 6⅝-inch, 1265 feet; 5⅜-inch, 88 feet.

In section 22 the shallow oil is found in the Hardinsburg formation at a depth of about 980 feet. The following is a record of a well drilled in this section:

LOG OF WELL No. 5 ON THE C. HIGHTOWER FARM.

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Surface, yellow, soft	3	3	Sandstone, light, medium..	36	560
Sandstone, light, medium..	10	13	Water at 550 feet.		
Shale, dark, soft	57	70	Shale, dark, soft	28	588
Water at 80 feet.			Sandstone, light, hard	32	620
Sandstone, light, medium..	90	160	Shale, light	12	632
Shale, dark soft	13	173	Limestone, medium	8	640
Limestone, medium	7	180	Shale, blue, soft	20	660
Coal V, soft	5	185	8¼-inch at 664 feet.		
Sandstone, light, medium..	15	200	Shale, dark, sandy	70	730
Shale, soft	5	205	Sandstone, light, soft	20	750
Sandstone, medium	20	225	Shale, blue	25	775
Shale, dark, soft	10	235	Sandstone and shale, brown	15	790
Limestone, light, hard	6	241	Sandstone-water (Mans- field)	17	807
Shale, soft, dark	9	250	Shale, blue (Mansfield)	11	818
Sandstone, light, medium..	15	265	Water at 850 feet.		
Shale, dark, soft	23	288	Sandstone, light	87	905
Sandstone, light, broken	22	310	Shale (Mansfield)	3	908
Shale, blue, soft	35	345	Limestone (Siberia) soft	5	913
Limestone, light, hard	1	346	6⅝-inch at 910 feet.		
Shale, dark, soft	4	350	Shale (Tar Springs), dark	32	945
Sandstone, light, medium..	8	358	Limestone (Glen Dean), medium	15	960
Shale, dark, soft	24	382	Shale (Glen Dean), soft	10	970
Limestone, light, hard	2	384	Limestone (Glen Dean), light, hard	2	972
Shale, dark, soft	36	420	Shale (Glen Dean), dark, soft	6	978
Limestone, light, hard	1	421	Sandstone, brown (Hardins- burg)	8	998
Shale, dark, shelly	27	448	Total depth, 998 feet.		
Limestone, gray, hard	3	451			
Shale, light, soft	24	475			
Shale, blue	10	485			
Shale, light	15	500			
Limestone, gray, hard	4	504			
Shale, blue, soft	20	524			

Nelson Bros., Contractors. Completed July 5, 1923.

Casing Record—12½-inch, 108 feet 4 inches; 10-inch, 303 feet; 8¼-inch, 664 feet; 6⅝-inch, 910 feet; 5⅞-inch, 88 feet 6 inches.

Patoka Township—A small oil pool exists northwest of the village of Arthur in sections 11 and 14, T. 2 S., R. 9 W. More than a dozen wells have been drilled in these two sections. The oil is obtained from the Oakland City sand.

Washington Township—Alford or East Petersburg Field. This field is located about three miles southeast of Petersburg in sections 31 and 32, T. 1 S., R. 7 W.

Geological Conditions—The geological conditions as revealed by outcrops and well records in this field are indicated in the following general section:

Pleistocene and Post-Pleistocene.....	45 feet
Petersburg group	130 feet
Staunton group	300 feet
Pottsville group	250 feet
Chester group	384 feet

The oil occurs in two horizons of the Chester, the Mooretown sandstone and the Paoli. The former is called the Oakland City sand and the latter the Brown sand in this field. The Mansfield seems to rest upon the Hardinsburg which is largely shale according to the records in this field. The Cypress sandstone has a thickness of 53 feet and rests on 18 feet of Beech Creek limestone which has a one-foot shale parting near the central horizon and is called the "Little Lime". The Reelsville limestone has a thickness of 15 feet and has 33 feet of Elwren shale resting upon it. The Beaver Bend limestone, called the "Big Lime", attains a thickness of 36 feet, and the Sample overlying it has a thickness of 30 feet. The Mooretown contains two sands, the upper nine feet and the lower eight feet being separated by three feet of shale. This is supposed to represent the Oakland City oil sand. The Paoli formation contains two oil sands separated by a thin hard shell. The upper one is 13 feet thick.

The following is the log of a well completed September 27, 1919, on the J. R. Chew lease, section 32:

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Surface clay	45	45	Sandy limestone	8	876
Sandstone	10	55	Broken shale	1	877
Shale	50	105	Limestone (Beech Creek) ..	10	887
Shell lime	5	110	Light shale (Elwren)	33	920
Coal	2	112	Limestone (Reelsville)	15	935
Shale	58	170	Sandstone (Sample)	24	959
Sand	10	180	Limestone (Sample)	3	962
Shale	60	240	Shale (Sample)	3	965
Limestone	5	245	Limestone (Beaver Bend) ..	36	1001
Coal	2	247	Shale (Mooretown)	35	1036
Shale	70	317	Shaly limestone (Moore-		
White shale	50	367	town)	3	1039
Shale	16	383	Shale (Mooretown)	2	1041
Sandy shale	87	470	Sandstone (Mooretown) ..	9	1050
Sandstone	55	525	Shale (Mooretown)	3	1053
Shale	25	550	Sandstone	8	1061
Sand	40	590	Brown limestone (Paoli) ..	10	1071
Shale	40	630	Shale (Paoli)	10	1081
Sandstone (water)	50	680	Sand (oil) (Paoli)	13	1094
Dark shale	30	710	Hard rock shell (Paoli) ...	1	1095
Sandstone	15	725	Broken sand	12	1107
Dark shale	45	770	Brown oil sand (Paoli) ...	2	1109
Lime shell	45	815	Total depth		1109
Sandstone (Cypress)	53	868			

Another well, No. 10, on the L. C. Thomas lease, in section 32, drilled into the brown sand at 1123 feet and was completed at 1138 feet. This well on the pump produced 20 barrels per day.

Petersburg Field—A small structure is known to exist in section 27, T. 1 N., R. 8 W., where Coal V is used at a key horizon. Gas has been produced in this section and used in Petersburg, which is situated largely in the section. The first well to be drilled in this field was in 1897. One of the wells, known as the "Jumbo", was drilled to a depth of 1133 feet. The record of the well as given in the Ditney Folio*, was interpreted to

* Ditney Folio. Indiana, United States Geological Survey, Fuller and Ashley, 1902.

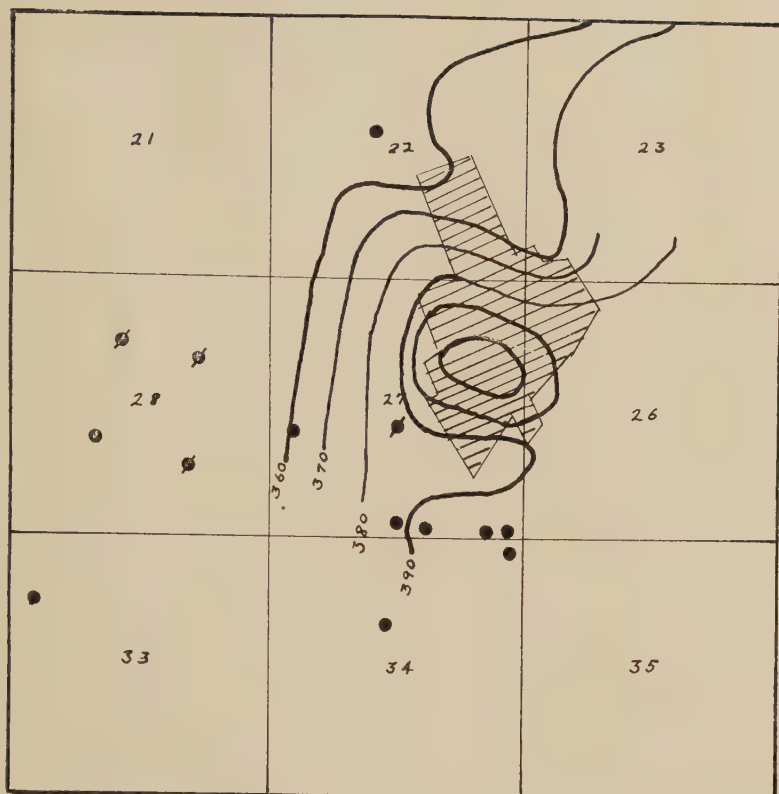


Fig. 12. Structural conditions at Petersburg. Contours drawn on Coal V. After Malott in "Petroleum and Natural Gas in Indiana."

reach the Utica shales of the Ordovician. The interpretation of the record by the writer is given in the following section:

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Drift (sand and gravel) ..	37	37	Shales and thin limestones	202	622
Limestone	11	48	Shales, sandstones and sandy limestone	90	712
Coal V and shale	13	61	Shales and sandstones (Tar Springs)	106	818
Shale	50	111	Limestone (Glen Dean) ...	18	836
Coal IVb	4	115	Shales and thin limestones (Hardinsburg)	50	886
Shale	30	145	Limestone (Golconda)	30	916
Coal IVa	2	147	Sandstone and shales (Cy- press)	25	941
Shales and sandstones	68	215	Limestone (Beech Creek) ..	35	976
Cannel coal and shale (IV)	10	225	Shale and limestone (El- wren)	53	1029
Shale	40	265	Limestone (Reelsville)	19	1048
Limestone	3	268	Shales (Sample)	60	1108
Sandy shale	32	300			
Limestone and shale	15	315			
Shale	60	375			
Coal and rock (IIIa)	5	380			
Shales	44	420			

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Limestone (Beaver Bend).	24	1132	Beaver Bend-Beech Creek interval		157
Shales and sandstones (Mooretown)	25	1157	Beech-Creek-Goleonda interval		157
Total depth		1157			

Rogers Station Pool—Favorable structural conditions appear on Coal V in the vicinity of Rogers Station in Washington Township. A well was drilled in section 7, T. 1 N., R. 8 W. The record shows 25 feet of alluvial sand, 667 feet of Pennsylvanian strata and 493 feet of Mississippian strata. The record furnished is too general to distinguish the divisions, but the oil sand was probably in the Mooretown formation. Following is a log of the well:

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Common sand, top	25	25	Sand shells (Pennsylvanian)	10	470
Shale and limestone shells (Pennsylvanian)	65	90	Sand (Pennsylvanian)	35	505
Soft sand (Pennsylvanian)	25	115	Limestone, shells and shale (Pennsylvanian)	55	560
Shale (Pennsylvanian)	25	140	Sand, shells and shale (Pennsylvanian)	40	600
Coal and black shale (Pennsylvanian)	10	150	Straight salt sand (Pennsylvanian)	92	692
White sand and black shale (Pennsylvanian)	10	160	Limestone (Mississippian)	193	885
Streaks of very sharp sand (Pennsylvanian)	27	187	Limestone (Mississippian)	15	900
White sand (Pennsylvanian)	13	200	Sandstone and shale (Mississippian)	20	920
White and limestone shells (Pennsylvanian)	20	220	Sand and limestone (Mississippian)	25	945
Shale (Pennsylvanian)	10	230	Sand with thin shale (Mississippian)	47	992
Shells (Pennsylvanian)	17	247	Red marl (Mississippian)	2	994
Coal (Pennsylvanian)	3	250	Cave (Mississippian)	14	1008
Caving slate and shale (Pennsylvanian)	10	260	Shale and oil sand (Mississippian)	19	1027
Sand (gas at top) (Pennsylvanian)	30	290	Sand (Mississippian)	30	1057
Black shale (Pennsylvanian)	30	320	Shale (Mississippian)	18	1075
Limestone and shale (Pennsylvanian)	40	360	Sand and limestone (Mississippian)	86	1161
Shale (Pennsylvanian)	15	375	Limestone (Mississippian)	24	1185
Limestone, shells and shale (Pennsylvanian)	85	460	Total depth		1185

The following is a report on the oil obtained from this well: 24 degrees gravity; 300 degrees fire test; 20 degrees cold test; 504 viscosity at 70 degrees.

GIBSON COUNTY.

Center Township—The only oil field of importance in this township is the Francisco field located a few miles southwest of the town of that name.

Francisco Field—The Francisco field is located in Center Township in section 13, T. 2 S., R. 10 W. This field was developed largely in 1922 and in the succeeding two years through the efforts of Mr. Perry Tichenor of Evansville.

Geological Conditions—The general stratigraphical conditions as revealed by the logs of wells drilled in this field are represented as follows:

Clays (Pleistocene and Recent)..... 15- 20 feet
 Shales, limestones, sandstones, coals (Pennsylvanian)....950-1000 feet
 Shales, limestones, sandstones (Mississippian).....440- 660 feet

The mantle rock consists of a brown loamy clay varying in thickness from 10 to 20 feet. Under the mantle rock lies about 140 feet of Post-Allegheny strata consisting of shales and a thin limestone bed.

The Allegheny division has a thickness of about 400 feet. Coal V occurs about 250 feet from the surface. Coal VII or possibly VI occurs at a depth of about 150 feet; Coal IVa or possibly IV at 365 feet; Coal III or IIIa at 465 feet, and a coal which is possibly Minshall, at 586 feet. The Brazil and Mansfield divisions of the Pottsville have a thickness of



Fig. 13. The Francisco oil pool. Contours drawn on Coal V. Interpretation by Albert Headley of field party of 1923.

about 275 feet. The Mansfield sandstone varies in thickness from 80 to 188 feet.

All of the formations of the Chester division of the Mississippian from the Buffalo Wallow to the Paoli inclusively are recognizable in the well logs.

The majority of the wells ended in the Sample formation. Well No. 1 on the Eissler lease was drilled into the Paoli. The Paoli interval in this well was occupied by shale and sandstone. The Mooretown interval was largely shale. The Beaver Bend limestone was broken by two shale beds. The Sample consisted of sandstone but in other wells the Sample contained at least one shale bed. The Reelsville-Elwren interval in some logs consists entirely of shale, in others limestone and sandstone are present. The Beech Creek limestone is usually reported as having a thickness of 30 feet but the thickness varies from 19 to 60 feet according to the logs. The Cypress interval is usually occupied by sandstone but in five wells shale was reported for the interval. Its thickness varies from 42 to 62 feet. In the Eissler well the Beech Creek limestone was

reported at 60 feet and the Cypress was very thin though the combined Beech-Creek-Cypress interval is about normal. The Golconda-Indian Springs interval is occupied by shale, limestone and occasionally partly by sandstone. The thickness of the formations varies from 18 to 40 feet. The Hardinsburg interval is usually occupied by sandstone though occasionally at least partly by shale. In three of the wells the thickness of the Hardinsburg sandstone was reported at 77 feet. In other logs the sandstone varied from 30 to 85 feet in thickness. In the records of four wells the Glen Dean limestone was reported as having a thickness of 25 feet, but the thickness as recorded in other logs varied from 10 to 63 feet. The Tar Springs interval is usually occupied by shale and sandstone. The thickness varies from 100 to 160 feet. The Siberia limestone when present has a thickness of 10 or 12 feet.

Oil-bearing Formation—The oil in the Francisco field is obtained from the Sample formation which consists of sandstones and shales. The sand in which the oil occurs varies in thickness from 9 to 18 feet.

The following are the logs of some of the wells drilled in the Francisco field. The interpretation of the record was made by the writer.

LOG OF WELLS No. 1 AND 2 ON THE HOLLINGSWORTH LEASE.

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Clay		20	Shale	115	700
Shale	30	50	Shale	50	750
Shale	40	90	Shale	60	800
Limestone	10	100	Sandstone	54	854
Shale	60	160	Shale	26	880
Coal VII	2	162	Sandstone (Mansfield) ...	98	976
Limestone	10	172	Shale	5	981
Shale	88	250	Sandstone (Tar Springs) ..	69	1050
Coal V	5	255	Shale	90	1148
Shale	60	315	Limestone (Glen Dean) ...	25	1173
Limestone	5	320	Sand (Hardinsburg)	77	1250
Coal IVa	5	325	Shale (Golconda)	12	1262
Shale	40	365	Limestone (Golconda) ...	3	1265
Coal	2	367	Shale (Golconda)	10	1275
Shale	13	385	Limestone	2	1277
Limestone	70	450	Shale (Cypress)	43	1320
Shale	10	460	Limestone (Beech Creek) ..	32	1352
Coal III	5	465	Shale	8	1360
Sandstone	15	480	Sandstone	10	1370
Shale	30	510	Shale	10	1380
Limestone	10	520	Sandstone (Sample)	20	1400
Shale	25	545	Shale	2	1422
Limestone	10	555	Pay sand		1424
Shale	25	580	Drilled to		1427
Limestone	5	585			

LOG OF WELL No. 3 ON THE HOLLINGSWORTH LEASE.

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Clay		15	Shale	54	264
Shale	125	140	Coal V	2	266
Coal VII	2	142	Shale	74	340
Shale	29	171	Limestone	5	345
Limestone	39	210	Coal IVa	5	350

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Shale	40	390	Sandstone (Mansfield) ...	80	1000
Limestone	10	400	Shale (Tar Springs)	20	1120
Shale	60	460	Sandstone (Hardinsburg)..	20	1140
Sandstone	10	470	Shale (Hardingsburg)....	10	1150
Shale	20	490	Sandstone (Hardinsburg)..	10	1160
Sandstone	25	515	Shale (Golconda).....	106	1266
Shale	35	540	Limestone (Golconda)....	6	1272
Limestone	5	545	Shale	28	1300
Shale	332	877	Sandstone (Cypress)	60	1360
Limestone	13	890	Limestone, brown (Beech Creek)	27	1387
Shale	10	900	Shale	35	1422
Limestone	10	910	Sandstone (Sample)		1422
Shale	10	920			

Drilled to 1440 feet.

LOG OF WELL No. 4 ON THE HOLLINGSWORTH LEASE.

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Clay	18	18	Limestone	5	860
Shale	20	38	Shale	7	867
Shale	92	130	Limestone	28	895
Coal	1	131	Shale	15	910
Shale	30	161	Sandstone (Mansfield) ...	80	990
Limestone	40	201	Shale (Tar Springs)	20	1010
Shale	53	254	Limestone	10	1020
Coal V	4	258	Red rock	5	1025
Shale	12	270	Limestone (Glen Dean)....	5	1030
Shale	270	320	Shale (Glen Dean).....	30	1060
Limestone	5	325	Limestone (Glen Dean)...	10	1070
Coal IVa	6	331	Shale (Hardinsburg)	20	1090
Shale	38	369	Sandstone (Hardinsburg)..	40	1130
Limestone	11	380	Shale (Hardinsburg).....	10	1140
Shale	20	400	Sandstone (Hardinsburg)..	5	1145
Sandstone	60	460	Shale (Golconda)	112	1257
Shale	20	480	Limestone (Golconda) ...	8	1265
Sandstone	10	490	Shale (Indian Springs)...	25	1290
Shale	40	530	Sandstone (Cypress)	62	1352
Limestone	5	535	Limestone (Beech Creek)..	19	1371
Shale	25	560	Shale (Elwren)	55	1426
Limestone	8	568	Sandstone (Sample)		1426
Shale	287	855	Oil		1426

Total depth, 1435 feet.

LOG OF WELL No. 1 ON THE REAVIS FARM.

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Clay		20	Shale	13	380
Shale	70	90	Limestone	70	450
Limestone	10	100	Shale	10	460
Shale	55	155	Coal III	5	465
Coal VII	2	157	Sandstone	15	480
Limestone	20	177	Shale	30	510
Shale	73	250	Limestone ..*	10	520
Coal V		250	Shale	25	545
Shale	100	350	Limestone	10	555
Limestone	15	365	Shale	25	580
Coal IVa	2	367	Limestone	5	585

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Shale	115	700	Shale (Golconda)	10	1275
Shale	50	750	Limestone (Golconda)	2	1277
Shale	50	800	Shale (Cypress)	43	1320
Sandstone (Mansfield)	54	854	Limestone (Beech Creek)..	32	1352
Shale	26	880	Shale (Elwren)	8	1360
Sandstone	96	976	Sandstone (Elwren)	10	1370
Shale	5	981	Shale (Elwren)	10	1380
Sandstone (Tar Springs)..	69	1050	Sandstone (Sample)	20	1400
Shale (Tar Springs).....	98	1148	Shale (Sample)	20	1420
Limestone (Glen Dean)...	25	1173	Sandstone	2	1422
Sandstone (Hardinsburg)..	77	1250	Oil		1422
Shale (Golconda)	12	1262	Finished		1424½
Limestone (Golconda)	3	1265			

LOG OF WELL No. 2 ON THE REAVIS LEASE.

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Clay		20	Shale	50	750
Shale	80	100	Shale	50	800
Limestone	55	155	Sandstone	54	854
Coal VII	2	157	Shale	26	880
Limestone	20	177	Sandstone	96	976
Shale	83	250	Shale	5	981
Coal V	2	252	Sandstone (Tar Springs)..	69	1050
Shale	98	350	Shale	98	1148
Limestone	15	365	Limestone (Glen Dean)...	25	1173
Coal IVa	2	367	Sandstone (Hardinsburg)..	77	1250
Shale	13	380	Shale (Golconda)	12	1262
Limestone	70	450	Limestone (Golconda)	3	1265
Shale	10	460	Shale (Golconda)	10	1275
Coal III	7	467	Limestone (Golconda)	2	1277
Sandstone	13	480	Shale (Cypress)	43	1320
Shale	30	510	Limestone (Beech Creek)..	30	1350
Limestone	10	520	Shale (Elwren)	8	1358
Shale	25	545	Limestone (Reelsville)....	12	1380
Limestone	10	555	Sandstone (Sample)	20	1400
Shale	25	580	Shale (Sample)	9	1409
Limestone	5	585	Sandstone, top (Sample)..		1409
Shale	115	700	Oil (Sample)		1410

Drilled to 1414 feet.

LOG OF WELL No. 3 ON THE REAVIS LEASE.

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Clay		20	Coal III	5	465
Shale	60	80	Sandstone	15	480
Limestone	20	100	Shale	30	510
Shale	55	155	Limestone	10	520
Coal VI	2	157	Shale	60	580
Limestone	20	177	Limestone	5	585
Shale	73	250	Shale	165	750
Coal V	5	255	Shale	50	800
Shale	95	350	Sandstone (Mansfield)....	64	854
Limestone	15	365	Shale (Mansfield)	26	880
Coal IVa	2	367	Sandstone (Mansfield)....	96	976
Shale	13	380	Shale (Tar Springs)	172	1148
Limestone	70	450	Limestone (Glen Dean) ...	25	1173
Shale	10	460	Sandstone (Hardinsburg)..	77	1250

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Shale (Golconda)	12	1262	Shale (Elwren)	15	1375
Limestone (Golconda)	3	1265	Limestone (Reelsville)	5	1380
Shale (Golconda)	10	1275	Shale (Reelsville)	15	1385
Limestone (Golconda)	2	1277	Top of sand (Sample)....	20	1405
Shale (Cypress)	43	1320	Show of oil (Sample)....	2	1407
Limestone (Beech Creek) .	40	1360	Stronger at		1415
Total depth, 1460 feet.					

LOG OF WELL No. 1 ON THE WELBORN LEASE.

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Clay		15	Shale	5	565
Shale	25	140	Limestone	312	877
Coal VII	2	142	Shale	23	900
Shale	18	160	Sandstone (Mansfield) ...	30	930
Limestone	20	180	Shale	100	1030
Shale	50	230	Sandstone (Tar Springs)..	100	1130
Coal V	4	234	Shale	10	1140
Limestone	70	350	Sandstone	10	1150
Coal IVa	5	355	Shale	20	1170
Shale	15	370	Limestone (Glen Dean)....	10	1180
Limestone	30	400	Sandstone (Hardinsburg)..	140	1320
Shale	20	420	Shale (Cypress)	60	1380
Sandstone	50	470	Limestone (Beech Creek) .	38	1418
Shale	10	480	Shale (Elwren)	32	1450
Sandstone	25	505	Top of sand (Sample)....	2	1452
Shale	25	530	Oil		1455
Limestone	30	560	Drilled to (total depth)...		1463

LOG OF WELL No. 1 ON THE WM. STEINER LEASE.

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Clay, yellow, soft		20	Shale, dark, soft	6	358
Shale, dark, soft	15	35	Shale, light, soft	17	375
Sand, gray, hard	6	41	Limestone, light, hard	4	379
Shale, light, soft	10	51	Shale, dark, soft	46	425
Limestone, broken	10	61	Shale, light, soft	10	435
Shale, dark, soft	5	66	Sandstone, light, medium..	41	476
Sandstone, light, soft	30	96	Shale, light, soft	1	477
Shale, light, soft	40	136	Coal III, black, soft	5	482
Limestone, light, hard	4	140	Shale, light, soft	1	483
Shale, dark, soft	20	160	Sandstone, light, soft	11	494
Limestone, black, light, medium	10	170	Shale, light, soft	11	505
Shale, light, soft	7	177	Shale, dark, soft	5	510
Shale, light, hard	10	188	Limestone, light, hard	8	518
Shale, dark, soft	7	195	Shale, light, medium	27	545
Limestone, dark, soft	30	225	Shale, brown, soft	10	555
Shale, dark, soft	22	247	Shale, light, soft	26	581
Limestone, light, medium..	7	254	Coal, black, soft (Minshall)	5	586
Shale, dark, soft	10	264	Shale, light, soft	19	615
Limestone, dark, soft	2	266	Shale, dark, soft	5	620
Coal V, black, soft	3	269	Shale, light, medium	10	630
Shale, light, soft	11	280	Limestone, light, hard	3	633
Limestone, light, medium..	17	297	Shale, brown, soft	7	640
Shale, light, soft	18	315	Shale, light, medium	10	650
Limestone, light, medium..	30	345	Shale, light, soft	45	695
Coal IVa, black, soft	7	352	Sandstone, light, hard	30	725
			Shale, light, soft	30	755

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Limestone, light, medium..	10	765	Limestone, light, hard		
Shale, light, soft	30	795	(Glen Dean)	5	1190
Sandstone, light, medium..	53	848	Sandstone, light, medium		
Shale, light, soft	15	864	(Hardinsburg)	85	1275
Limestone, light, medium..	3	866	Shale, light, soft (Cypress)	34	1309
Limestone, light, medium..	9	875	Limestone, light, medium		
Shale, light, soft	2	877	(Cypress)	1	1310
Sandstone, light, soft			Shale, dark, soft (Cypress)	7	1317
(Mansfield)	188	1065	Limestone, light, hard		
Shale, dark, soft	15	1080	(Beech Creek)	35	1350
Limestone, black, light, soft			Shale, light, soft (Elwren)	2	1352
(Siberia)	10	1090	Limestone, light, hard (El-		
Shale, light, medium (Tar			wren)	2	1354
Springs)	7	1097	Limestone, light, soft (El-		
Limestone, light, soft (Tar			wren)	20	1374
Springs)	13	1110	Limestone, brown, hard		
Sandstone, light, hard (Tar			(Reelsville)	18	1392
Springs)	5	1115	Sandstone, light, soft		
Sandstone, light, medium			(Sample)	17	1409
(Tar Springs)	43	1158	Sandstone, light, soft		
Shale, dark, soft (Glen			(Sample)	14	1423
Dean)	7	1165	Shale, dark, soft (Sam-		
Shale, red, red rock (Glen			ple)	21	1444
Dean)	8	1175	Sandstone, gray, medium		
Shale, dark, soft (Glen			(Sample)	1½	1445½
Dean)	12	1185	Total depth		1445½

Casing Record—1, 16-inch, 19 feet 3 inches, put in 2/23/23; 21, 12½-inch, 358 feet, SLM put in 3/15/23; 45, 10-inch, 866 feet, SLM put in 4/16/23; 61, 8¼-inch, 1185 feet, SLM put in 4/19/23; 65, 6⅝-inch, 1309 feet, SLM put in 4/25/23.

Remarks—3 bailers water per hour at 61 feet; hole full water, 66 feet; hole full water, 1225 feet; first show oil at 1444 feet.

LOG OF WELL No. 1 ON THE EISSLER LEASE.

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Clay		18	Shale	53	915
Shale	107	125	Sandstone (Mansfield) ..	97	1012
Limestone	10	135	Shale (Buffalo Wallow)...	51	1063
Shale	25	160	Limestone (Siberia)	12	1075
Limestone	15	175	Shale (Tar Springs)	72	1147
Shale	90	265	Limestone (Tar Springs)..	7	1154
Coal V	7	272	Shale (Tar Springs)	23	1177
Clay	13	285	Limestone (Glen Dean)...	63	1240
Shale	25	410	Shale (Hardinsburg)	5	1245
Limestone	15	425	Sandstone (Hardinsburg)..	40	1285
Shale	35	460	Shale (Golconda)	5	1290
Sandstone	45	505	Sandstone (Golconda)	5	1295
Shale	75	580	Shale (Golconda)	8	1303
Sandstone	35	615	Red rock (Cypress)	5	1308
Limestone	13	628	Shale	17	1325
Shale	72	700	Limestone	2	1327
Sandstone	25	725	Limestone (Beech Creek)..	58	1385
Shale	55	780	Shale (Elwren)	2	1387
Sandstone	15	795	Limestone	11	1398
Shale	45	840	Limestone (Reelsville)	7	1405
Sandstone	22	862	Shale	10	1415

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Sandstone (Sample)	39	1454	Sha'e (Mooretown)	21	1593
Shale (Beaver Bend)	96	1550	Limestone (Mooretown) ..	3	1596
Limestone (Beaver Bend) ..	8	1558	Shale (Paoli)		1670
Shale (Beaver Bend)	3	1561	Sandstone		1670
Red rock (Beaver Bend) ..	11	1572	Quit drilling		1675

Columbia Township—Deep wells have been drilled in sections 10, 17 and 20 in this township. The logs of these wells reveal about 800 feet of Pennsylvanian strata and about 600 feet of Chester-Mississippian strata.

In the Oscar Hadlock well in section 20 the contact of the Cypress sandstone with the Beech Creek limestone occurs at 645 feet below sea level. In the Francisco oil field about 9 miles west, the contact lies about 927 feet below sea level, giving a dip of 33 feet to the mile toward the west for the Mississippian formations.

The following is a log of the Hadlock well as furnished by the Indian Refining Company. The interpretations of the stratigraphy are by the writer.

Oscar Hadlock Well No. 1, Columbia Township, Section 20. Well completed December 30, 1918.

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Dark soil, soft	1	1	Light shale, soft	40	740
Yellow clay, soft	5	6	White sandstone (Mans- field)	85	825
Dark shale, soft	34	40	Grey shale, soft (Tar Springs)	40	865
Grey sandstone, soft	75	115	Dark shale, soft	35	900
Light sha'e, soft	35	150	Grey limestone, hard (Glen Dean)	15	915
Coal, soft	10	160	Dark shale, soft	25	940
Dark shale, soft	5	165	Grey limestone, hard	10	950
White mud	10	175	Grey shale, soft (Hardins- burg)	20	970
Dark sha'e, soft	15	190	Dark sha'e, soft	30	1000
White shale, soft	55	245	Dark limestone, hard (Gol- conda)	30	1030
Dark shale, soft	5	250	Light sandstone, soft (Cy- press)	30	1060
White shale, soft	25	275	Light shale, hard	10	1070
Black shale, soft	5	280	Brown limestone, hard (Beech Creek)	10	1080
Sandy shale, soft	35	315	Brown limestone, hard	30	1110
White shale, soft	30	345	Light sandstone, hard (El- wren)	30	1140
Dark shale, soft	5	350	Limestone, shale, hard (Reelsville)	15	1155
Light shale, soft	25	375	Light limestone, hard	10	1165
Dark shale, soft	15	390	Brown sandstone, hard (Sample)	15	1180
Dark limestone, hard	10	400	White limestone, very hard.	5	1185
Dark shale, soft	10	410	Dark shale, soft	5	1190
Light shale, soft	30	440	Blue shale, hard	5	1195
Light limestone, hard	2	442	Light limestone, hard	5	1200
Light shale, soft	10	452	Black shale, soft	5	1205
Light limestone, hard	3	455	Light shale, soft	10	1215
Light shale, soft	10	465			
Light limestone, hard	3	468			
Light shale, soft	10	478			
Light limestone, hard	2	480			
Light shale, soft	20	500			
Light shale, soft	35	535			
Light limestone, hard	30	565			
Black shale, soft	5	570			
Light shale, soft	70	640			
Light Sandstone, hard	60	700			

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Light sandstone, hard	10	1225	Light sandstone, soft	30	1310
Light limestone, very hard.	5	1230	Light shale, soft	10	1320
Light shale, soft	5	1235	Light sandstone, hard	10	1330
Dark shale, soft	20	1255	Dark limestone, hard (Pa- oli)	15	1345
Light limestone, hard (Beaver Bend)	15	1270	Light sandstone, hard	5	1350
Red rock, soft (Moore- town)	10	1280	Broken limestone, hard ...	15	1365

Well plugged.

Casing Record—12½-inch, 37 feet 8 inches; 10-inch, 377 feet 1 inch; 8¼-inch, 865 feet; 6½-inch, 1080 feet; 4¾-inch, 1310 feet.

Union Township—The following is the record of a well drilled in the northwest corner of the northeast quarter of section 33 on the Hollen farm which is about two and one-half miles east of Francisco at an elevation of about 491 feet above sea level. The log was furnished the writer by Mr. T. C. Heistand of the Pure Oil Company in 1923. The interpretation of horizons and formations is by the writer.

LOG OF WELL DRILLED ON THE HOLLEN FARM.

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Shale, blue		210	Sandstone, white (Mans- field)	20	890
Shale, black	5	215	Shale, black (Mansfield) ..	39	929
Sandstone, gray	30	245	Sandstone, white (Mans- field)	21	950
Shell	12	257	Shale (Mansfield)	10	960
Shale, black	14	271	Sandstone (Mansfield)	15	975
Coal V	8	279	Limestone, white (Siberia) ..	5	980
Shale, gray	5	284	Shale, black (Tar Springs) ..	20	1000
Limestone	20	304	Shale, gray (Tar Springs) ..	10	1010
Shale	16	320	Limestone, white (Tar Springs)	5	1015
Shale, black	5	325	Shale, gray (Tar Springs) ..	60	1075
Shale, gray	5	330	Limestone, white (Glen Dean)	10	1085
Sandstone, gray, soft	10	340	Shale, gray (Glen Dean) ..	10	1095
Shale, gray	12	352	Limestone, sand (Glen Dean)	8	1103
Limestone, white	10	372	Shale	7	1110
Sandstone, blue	18	390	Sandstone	15	1125
Shale, black	5	395	Limestone, green	110	1235
Shale, gray	15	410	Sandstone (Cypress)	65	1300
Limestone, white	4	414	Limestone (Beech Creek) ..	10	1310
Shale, gray	21	435	Shale (Beech Creek)	12	1322
Water, sandstone	20	455	Limestone, little (Beech Creek)	21	1343
Shale, gray	30	485	Sandstone (Elwren)	15	1358
Limestone, white	10	495	Shale	5	1363
Shale, white	20	515	Sandstone (Sample)	47	1410
Limestone	12	527	Shale	10	1420
Sandstone, gray	8	535	Limestone (Beaver Bend) ..	47	1467
Shale	2	537	Trace red rock		
Limestone, white	12	549	Shale (Mooretown)	3	1470
Shale, gray	36	585	Limestone (Mooretown) ...	5	1475
Sandstone, white	30	615	Shale (Mooretown)	52	1517
Shale, black	9	624			
Limestone, white	11	635			
Shale, gray	75	710			
Shale, brown	65	775			
Sandstone, white	40	815			
Mud, white	55	870			

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Sandstone (Pleistocene and recent)	50	50	Shale	5	500
Limestone (Pennsylvanian)	50	100	Sandstone	10	510
Shale	200	300	Coal	6	516
Limestone	25	325	Shale	54	570
Shale	60	385	Coal	2	572
Limestone	45	430	Shale	78	650
Coal	5	435	Coal	6	656
Shale	15	450	Shale	154	810
Sandstone	45	495	Sandstone (Oil sand)	14	824

Log of Kendle Well No. 10 in N. W. $\frac{1}{4}$ of the S. W. $\frac{1}{4}$ of section 10, T. 2 S., R. 11 W.

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Sand (Pleistocene and recent)	50	50	Shale	20	488
Limestone (Pennsylvanian)	15	85	Sandstone (Gas sand)	3	491
Shale	195	280	Shale	13	510
Limestone	23	303	Shale, black	102	612
Limestone, shaly	125	428	Shale, sandy	125	737
Coal	5	433	Coal	3	740
Fire clay	20	453	Shale	104	844
Sandstone (Gas sand)	15	468	Sandstone	20	864

East Princeton Field—This field is located about two and one-half miles east of Princeton in section 10, T. 2 S., R. 10 W., and in section 3. The principal wells are located along the road separating these two sections and near a north and south line passing through the centers of the sections.

Structural conditions favorable to the accumulation of oil in this field were determined by Dr. J. R. Reeves, who used a limestone above the oil-bearing sand as the key horizon. At the time of investigation not enough drilling had been done to enable him to outline the structure.



Fig. 15. Diagram showing possible structural conditions in the East Princeton pool. Contours drawn on a limestone occurring above the oil sand. Data furnished by Dr. J. R. Reeves.

M. Witherspoon Well No. 1, Center Township, Section 26. Well completed April 29, 1920.

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Clay, yellow, soft	30	30	Shale, dark, soft (Tar Springs)	5	915
Quick sand, gray, soft	15	45	Sandstone, dark, medium;	25	940
Shale, dark, soft	7	52	Shale, dark, soft	10	950
Quick sand, light, soft.....	6	58	Water sand, light, soft....	110	1060
Shale, dark, soft.....	12	70	Shale, dark, soft (Golconda)	45	1105
Limestone, gray, hard....	10	80	Sandstone, limy, white, hard	5	1110
Shale, dark, soft	25	105	Sandstone, brown, medium Cypress)	5	1115
Limestone, white, hard....	45	150	Sandstone, light, soft.....	2	1117
Shale, dark, soft	75	225	Water sand, white, soft...	43	1160
Shale, blue, soft.....	95	355	Shale, dark, soft (Beech Creek)	5	1165
Shale, black, soft.....	20	375	Limestone, dark, hard....	2	1167
Limestone, white, hard....	25	400	Shale, dark, soft.....	10	1177
Shale, dark, soft.....	40	440	Limestone, dark, hard....	3	1180
Limestone, white, hard....	20	460	Shale, dark, soft (Elwren)	15	1195
Shale, black, soft.....	10	470	Limestone, dark, hard (Reelsville)	4	1199
Shale, dark, soft.....	30	500	Shale, dark, soft.....	15	1214
Limestone, white, hard....	30	530	Limestone, dark, hard....	3	1217
Shale, dark, soft.....	21	551	Shale, dark, soft (Sample)	10	1227
Limestone, white, hard....	9	560	Limestone, dark, hard....	3	1230
Shale, dark, soft.....	5	565	Shale, dark, soft.....	30	1260
Limestone, white, hard....	35	600	Sandstone, dark, soft.....	35	1295
Shale, dark, soft.....	50	650	Sandstone, light, soft.....	41	1336
Limestone, blue, hard....	5	655	Shale, dark, soft.....	20	1356
Shale, white, soft.....	20	675	Shale, light, soft (Beaver Bend)	9	1365
Shale, dark, soft.....	10	685	Limestone, gray, hard....	4	1369
Limestone, white, hard....	15	700	Red rock, red, soft.....	10	1379
Shale, dark, soft.....	10	710	Shale, dark, soft (Mooretown)	21	1400
Limestone, blue, hard....	5	715	Sandy shale, light, soft....	40	1440
Shale, dark, soft.....	35	750	Shale, dark, soft.....	20	1460
Shale, light, soft.....	30	780	Water sand, white, soft...	40	1500
Shale, dark, soft.....	20	800			
Sandstone, light, soft (Mansfield)	100	900			
Limestone, gray, hard (Si-beria)	10	910			

Well Plugged.

Casing Record—16-inch, 74 feet 4 inches; 12½-inch, 360 feet; 10-inch, 910 feet; 8¼-inch, 1247 feet; 6¾-inch, 1356 feet.

Water filled at 45, 835, 965, 1122, 1260 and 1470 feet; two bailers per hour at 530 feet.

Showing of gas at 1115 feet; white water sand at 1500 feet. Well plugged.

Washington Township—There are two oil fields in Washington Township. The Hazleton or Union field is the larger. It contains three pools, the McDonald, the Hoover and the Mt. Olympus. The other field is the Wheeling, which, when better outlined, may be found to contain one or more pools.

The McDonald Pool—The McDonald pool occupies the northeastern part of the field. It is located in the western part of section 5 and in the northeastern part of section 6, T. 1 S., R. 9 W.

The surface relief is moderately rugged. Differences of elevation of sixty or more feet occur within the oil-bearing area. The slopes are in most instances not abrupt although the valleys are narrow.

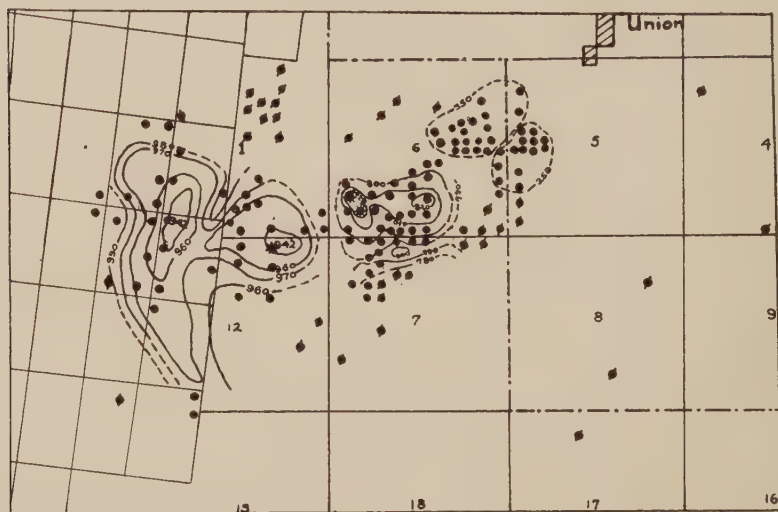


Fig. 16. Diagram of the Union or Hazleton field showing apparent structural conditions in the McDonald, Hoover and Mt. Olympus pools. Interpretation of structural conditions by W. A. Thomas, field assistant in 1923.

Geological Conditions—The stratigraphical conditions which are revealed by minor outcrops of the strata and by the well logs collected from the area are recorded in the following generalized section:

Pleistocene and Post-Pleistocene clays and sands..... 30 to 60 feet
Pennsylvanian strata—

Shales and coal (Post-Allegheny)..... 50 to 100 feet
Shales, sandstones, limestones, coals (Allegheny)...550 to 600 feet
Sandstones, shales and coal (Pottsville).....190 to 210 feet
Mississippian strata (Chester division).....600 to 650 feet

The following are the logs of some of the wells in the McDonald pool. The interpretations of records are by the writer.

Log of Well No. 3 on the Ed Frederick farm. N. E. $\frac{1}{4}$ of Sec. 6, R. 10 W., T. 1 S. Elevation 454 feet. Drilled by Murphy Oil Co. of Penna.

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Soil		40	Shale, broken, lime	38	308
Shale	53	93	Limestone	102	410
Coal	4	97	Coal III or IIa	5	415
Shale	53	150	Shale	35	450
Sandstone	55	205	Shale, gas	2	452
Shale	45	250	Shale, black	28	480
Shale, white	20	270	Sandstone, little gas	11	491

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Shale, black	14	505	Shale (Golconda)	5	1220
Limestone	10	515	Limestone (Golconda) ...	5	1225
Shale, light	60	575	Shale (Golconda)	5	1230
Shale, black	10	585	Limestone, brown (Gol-		
Shale, light	85	670	conda)	12	1242
Sandstone	20	690	Shale (Indian Springs) ..	18	1260
Limestone, black, broken			Sandstone, broken (Cy-		
(Minshall)	18	708	press)	15	1275
Sandstone, broken	12	720	Sandstone (Cypress)	35	1310
Sandstone, show oil	6	726	Sandstone, water (Cypress)	30	1340
Sandstone	7	733	Limestone (Beech Creek) .	15	1355
Shale (Mansfield)	27	760	Red rock	10	1365
Sandstone	140	900	Shale (Elwren)	26	1391
Shale	5	905	Limestone (Reelsville)	10	1401
Limestone	5	910	Water sand (Sample)	34	1435
Shale	30	940	Limestone, brown (Beaver		
Sandstone	30	970	Bend)	16	1451
Shale	20	990	Shale	14	1465
Limestone, broken	40	1030	Sandstone, broken	28	1493
Limestone (Siberia)	10	1040	Sandstone (Mooretown) ...	3	1496
Sandstone (Tar Springs) .	75	1215	Total depth		1496

Show oil at 726 feet. Water—Hole full at 900 feet; water—hole full at 1340 feet; water—hole full at 1435 feet. Show oil in top and bottom water at 1496 feet.

Casing Record—12½-inch, 40 feet; 10-inch, 118 feet; 8¼-inch, 505 feet; 6¼-inch, 1220 feet; 4⅞-inch, 1391 feet.

Commenced drilling February 2, 1923. Finished drilling March 2, 1923.

Log of Well No. 18 on the Alice Frederick farm. N. W. ¼ of Sec. 5, Clay Twp. Drilled by Murphy Oil Co. of Penna.

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Soil		50	Limestone, broken	90	600
Shale	45	95	Shale	20	620
Coal VI	4	99	Sandstone	10	630
Shale	81	180	Shale	15	645
Sandstone	76	256	Sandstone	15	660
Shale	64	320	Shale	37	697
Sandstone	60	380	Sandstone	43	710
Shale	35	415	Shale	30	740
Coal III	6	421	Sandstone	5	745
Shale, light	37	458	Shale	5	750
Shale, black	20	478	Sandstone	3	753
Shale, light	27	505	Shale	18	771
Limestone, broken	5	510	Sandstone—oil (Mansfield)	6	777

Total depth, 777 feet.

Water at 256 feet; water at 380 feet. Top six feet show oil—balance little water.

Casing Record—12½-inch, 50 feet; 10-inch, 104 feet; 8¼-inch, 660 feet; 6¼-inch, 685 feet; 4⅞-inch, 110 feet; 2-inch, 766 feet.

Commenced December 16, 1922. Completed December 22, 1923.

Drilled by the Murphy Oil Company of Pennsylvania.

Log of Well No. 3 on the Jasper N. Davidson farm, Sec. 27, Clay Twp.

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Surface	10	10	Limestone, hard	5	475
Blue mud	35	45	Sandstone, light	11	486
Limestone	12	57	Shale, dark	9	495
Shale, light	25	82	Shale, light	10	505
Shale, dark	72	154	Limestone, hard	6	511
Limestone	16	170	Shale, light	46	557
Shale, gritty	25	195	Limestone, hard	4	561
Limestone, sandy	55	250	Shale, dark	64	625
Shale, dark	95	345	Shale, light	52	677
Limestone, gritty	13	358	Shell, broken	6	683
Shale, light	14	372	Shale, dark	6	689
Shale, dark	48	420	Coal (Minshall)	4	693
Shale, light	10	430	Shell, broken	6	698
Shale, dark	6	436	Sandstone, soft	12	710
Limestone, hard	2	438	Shale, light	27	737
Coal	4	442	Shale, dark	24	761
Sandstone	6	448	Limestone, sandy	5	766
Limestone, sandy, hard....	16	464	Sandstone (Mansfield)	15	781
Shale, black	6	470			

Gas, 446 to 448 feet; gas, 475 to 482 feet. Oil, 700 to 710 feet; oil, 766 to 777 feet.

Casing Record—12-inch at 40 feet; 10-inch at 163 feet; 8-inch at 452 feet; reduced to 6 $\frac{5}{8}$ -inch hole at 681 feet.

WELL LOGS FROM HOOVER POOL.

The following are the logs from some of the wells in the Hoover pool. The writer has placed his interpretation of the stratigraphical conditions in the logs.

Log of Well No. 8 on Jas. Hoover lease, S. W. quarter of section 6. Elevation 554.

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Clay, yellow		15	Shale, dark	17	585
Sandstone, brown	45	60	Coal, black	10	595
Shale, black	20	80	Limestone	15	610
Coal, black	5	85	Shale, dark	50	660
Shale, black	40	125	Shale, white	10	670
Limestone, gray	10	135	Limestone, gray	12	682
Shale, gray	50	185	Shale, black	8	690
Limestone, white	35	220	Shale, white	45	735
Shale, white	20	240	Limestone, gray	10	745
Limestone, gray	10	250	Shale, white	30	775
Shale, black	15	265	Limestone, gray	5	780
Limestone, gray, hard....	41	306	Shale, black	20	800
Shale, black, soft	44	350	Limestone, gray	5	805
Limestone, gray	15	365	Shale, black	18	823
Shale, black	45	410	Limestone, gray	17	840
Limestone, white	35	445	Shale, white	20	860
Shale, white	10	455	Sandstone, gray	10	870
Limestone, white	5	460	Shale, white	5	875
Shale, white	40	500	Limestone, gray	15	890
Shale, dark	50	550	Shale, black	20	910
Shale, white	18	568	Limestone, gray	15	925

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Shale, white	55	980	Shale, brown, soft (Indian Springs)	20	1375
Limestone, gray	25	1005	Sandstone, dark, soft....	Oil showing	
Sandstone, black (Mansfield)	15	1020	Sandstone (Oil sand)	20	1395
Shale, gray	20	1040	Limestone, gray, hard....	5	1400
Sandstone, white	10	1050	Sandstone, white (Cypress)	60	1460
Shale, gray	10	1060	Limestone, gray (Beech Creek)	20	1480
Limestone, black	30	1090	Shale, dark (Elwren).....	20	1500
Shale, gray	15	1105	Rock, red, soft (Reelsville)	5	1505
Limestone, white (Siberia)	5	1110	Limestone (Sample)	17	1522
Shale (Tar Springs)	50	1160	Limestone, gray, hard (Beaver Bend)	36	1558
Limestone	14	1174	Shale, dark, soft	4	1562
Sandstone, water sand....	31	1205	Sandstone, gray, hard (Oil)	6	1568
Limestone	5	1210	Sandstone, gray, hard (Show)	6	1574
Sandstone	5	1215	Limestone, dark, hard (Mooretown)	13	1587
Shale, dark	10	1225	Sandstone, light, soft....	7	1594
Lime, white	25	1250	Shale, dark soft	6	1600
Sandstone, gray	25	1275	Limestone, gray, hard	5	1605
Shale, black	5	1280	Shale, light, soft	5	1610
Sandstone, gray	5	1285	Sandstone, light, soft	8	1618
Shale, blue	11	1296	Sandstone, white, soft (Water)	2	1620
Shale, gray	4	1300			
Shale, dark (Hardinsburg).	22	1322			
Sandstone, gas sand (Gas, shale)	9	1331			
Shale, gray	23	1354			
Limestone, dark, hard (Goldconda)	1	1355			

Jas. Hoover Well No. 12, S. W. quarter of section 6. Elevation 526.

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Clay, yellow, soft	15		Gritty lime, light, soft....	10	461
Shale, dark, soft	10	25	Shale, dark, soft	10	471
Limestone, dark, soft	4	29	Shale, white, soft	30	501
Shale, light, soft	30	50	Shale, dark, soft	40	541
Shale, dark, soft	25	75	Shale, light, soft	20	561
Shale, light, soft	16	91	Limestone, light, hard	6	567
Shale, dark, soft	20	111	Shale, dark, soft	10	577
Limestone, light, hard	15	126	Sandy lime, light, soft....	15	592
Shale, light, soft	30	156	Shale, light, soft	13	605
Shale, dark, soft	18	174	Limestone, light, hard	5	610
Limestone, light, hard	4	178	Shale, light, soft	30	640
Shale, dark, soft	10	188	Shale, dark, soft	18	658
Shale, dark, soft	12	200	Shale, light, soft	15	673
Limestone, white, hard ...	12	212	Limestone, light, muddy, soft	14	687
Shale, dark, soft	13	225	Shale, dark, soft	22	709
Sandy lime, light, hard....	25	250	Shale, light, soft	27	736
Shale, dark, soft	30	280	Limestone, gray, hard	3	739
Shale, light, soft	16	296	Shale, dark, soft	16	755
Shale, dark, soft	10	306	Broken lime, light, soft....	5	760
Shale, dark, soft	10	316	Shale, dark, soft	20	780
Broken lime, light, muddy, soft	50	366	Shale, light, soft	15	795
Limestone, light, hard	5	371	Limestone, light, soft	5	800
Shale, light, soft	35	396	Limestone, light, hard	5	805
Sandy lime, soft	20	416	Shale, dark, soft	20	825
Shale, light, soft	15	431	Sandy lime, muddy, soft...	10	835
Shale, dark, soft	20	451	Limestone, white, hard ...	7	832

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Shale, dark, soft	40	872	Sandstone, light, soft	12	1169
Shelly lime and slate, soft.	43	915	Shale, dark, soft	8	1177
Shale, dark, soft	100	1015	Sand lime, light, soft	15	1192
Limestone, broken, soft...	10	1025	Sandstone, light, soft	6	1198
Shale, dark, soft	20	1045	Shale, dark, soft	10	1208
Sandy lime, light, soft....	8	1048	Sandy lime, light, soft....	35	1243
Shale, dark, soft	5	1053	Shale, dark, soft	7	1250
Limestone, sandy, soft....	10	1063	Limestone, gray, hard		
Shale, dark, soft	20	1083	(Glen Dean)	9	1259
Limestone, sandy, soft, light			S. L. M.		1251
(Mansfield)	8	1094	Sandy lime, light, muddy,		
Shale, dark, soft	5	1099	soft	20	1279
Sandstone, light, hard	10	1109	Sandstone, light, muddy,		
Limestone, light, muddy,			soft	5	1284
hard	15	1124	Shale, dark, soft	18	1313
Limestone, light, muddy,			Limestone, light, hard (Gol-		
hard (Siberia)	5	1129	conda)	7	1320
Sandstone, white, soft (Tar			Shale, dark, soft (Indian		
Springs)	8	1137	Springs)	17	1337
Limestone, sandy, muddy,			Gas sand (Cypress)	3	1340
hard	20	1157	Sandstone, light, soft (Slate		
			and broken sand)	4	1359

Filled at 1105 feet. Gas sand, 1284 feet. Bottom of gas sand, 1296 feet. Oil sand, brown, coarse, 1340 feet. Bottom of oil sand fine and lighter. Break at 1353 to 1355.

John Zimmerman Well No. 1, section 12. Elevation 509 feet 6 inches.

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Soil, dark, soft	1	1	Shale, light, soft	34	436
Clay, yellow, soft	8	9	Sandstone, light, soft	6	442
Lime boulder, hard	5	14	Shale, dark, soft	5	447
Sandstone, muddy	16	30	Sandstone, light, soft	9	456
Mud, white, putty	15	45	Shale, light, soft	6	462
Shale, dark, soft	20	65	Shale, dark, soft	16	478
Shale, light, soft	30	95	Sandstone, dark, hard	5	483
Shale, dark, soft	5	100	Coal, black, soft	2	485
Limestone, dark, hard	4	104	Shale, light, soft	23	508
Coal, black, soft	4	108	Limestone, white, hard	7	515
Shale, dark, soft	9	117	Shale, black, soft	10	525
Limestone, dark, hard	4	121	Shale, light, soft	10	535
Sandstone, dark, hard	9	130	Coal, black, soft	3	538
Shale, light	25	155	Shale, light, soft	7	545
Shale, dark, soft	18	173	Limestone, gray, hard	5	550
Sandstone, light, soft	5	178	Shale, dark, soft	5	555
Shale, light, soft	18	196	Shale, light, soft	19	574
Limestone, light, hard	4	200	Shale, dark, soft	8	582
Shale, light, soft	7	207	Limestone, gray, hard	8	590
Limestone, sandy	8	215	Shale, light, soft	10	600
Shale, light, soft	10	225	Limestone, white, hard ...	5	605
Shale, black, soft	15	240	Shale, light, soft	5	610
Coal, black, soft	4	244	Shale, black, soft	15	625
Shale, dark, soft	56	300	Shale, light, soft	5	630
Limestone, light, hard	2	302	Sandstone, light, soft	3	633
Shale, black, soft	44	346	Shale, light, soft	18	651
Limestone, gray, hard	3	349	Limestone, gray sand	12	663
Shale, dark, soft	41	390	Shale, dark, soft	7	670
Limestone, gray, hard ...	12	402	Shale, light, soft	15	685

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Shale, black, soft	15	700	Limestone, gray, hard	6	1457
Shale, light, soft	25	725	Sandstone, gray (Beech Creek)	3	1460
Shale, dark, soft	25	750	Rock, red	3	1463
Limestone, gray, hard	20	770	Shale, dark (Elwren)	7	1470
Sandstone, dark, hard	22	792	Shale, light	10	1480
Sand and slate, dark, soft.	18	810	Limestone, gray	14	1494
Limestone, gray, hard	20	830	Sandstone, gray	7	1501
Shale, light, hard	5	835	Limestone, gray, coarse (Reelsville)	5	1506
Sand and slate, light, soft.	17	852	Shale, dark (Sample)	1	1507
Shale, dark, soft	33	885	Limestone, brown	2	1509
Shale, light, soft	5	890	Shale, dark	10	1519
Limestone, gray, hard	5	895	Limestone, brown (Beaver Bend)	14	1533
Shale, dark, soft	20	915	Sandstone, gray coarse (Mooretown)	4	1537
Sandstone, white, hard ...	10	925	Sandstone, white	1	1538
Shale, black, soft	15	940	Sandstone, white	3½	1541½
Shale, light, soft	10	950	Sandstone, darker	3½	1545
Shale, dark, soft	11	961	Sandstone, lighter	2	1547
Shale, light, soft	6	967	Sandstone (Oil)	2	1549
Limestone, green, soft	23	990	Sandstone, lighter	2½	1551½
Sandstone, white water (Mansfield)	6	996	Sandstone, dark (Oil) ...	6	1557½
Sandstone, white water ...	10	1015	Sandstone, dark	2	1559½
Shale, dark	5	1020	Sandstone, light	2	1561½
Sandstone, white water ...	15	1035	Sandstone, light	3½	1565
Shale, dark	13	1048	Sandstone, water	1	1566
Sandstone, dark	17	1065	Sandstone, water	4½	1570½
Shale, light	10	1075	Sandstone, water	2	1572½
Shale, dark	8	1083	Sandstone, darker	4½	1577
Limestone, dark (Siberia)	15	1098	Sandstone, darker	5	1582
Shale, dark (Tar Springs)	7	1105	Sandstone, gray	2	1584
Sandstone, light	62	1167	Shale	5	1589
Shale, dark	3	1170	Sandstone, gray	7	1596
Limestone, dark, hard	8	1178	Sandstone, gray	4	1600
Shale, light	7	1185	Sandstone, light	4	1604
Sandstone, white water...	55	1240	Sandstone, light, fine	5	1609
Shale, light	4	1244	Sandstone, dark (Oil)	2½	1611½
Sandstone, light, hard (Hardinsburg)	9	1253	Limestone, brown (Paoli) .	3½	1615
Shale, dark	4	1257	Sandstone, gray	6½	1621½
Sandstone, dark	3	1260	Sandstone, gray	2½	1624
Shale, dark	40	1300	Shale	4	1628
Shale, light	16	1316	Shale, dark	2	1630
Limestone, dark (Golconda)	18	1334	Limestone, gray	4	1634
Shale, dark	14	1348	Shale, dark	8	1642
Sandstone, dark, soft	15	1363	Sandstone, brown, coarse.	17	1659
Shale, dark	17	1380	Sandstone, soft	2	1661
Sandstone, dark	6	1386	Sandstone, gray, hard	8	1669
Shale, dark, shelly	9	1395	Shale, dark	4	1673
Sandstone, water, dark ...	5	1400	Rock, red	3	1676
Sandstone, white water (Cypress)	47	1447	Limestone, gray		1676
Sandstone, gray	4	1451			

Water, 633 feet. Hole filled with water, 1000 feet. Hole filled with "Blue Lick," 1400 feet; showing of oil at 1549 feet. Gas at 1659 feet. Break from 1661 to 1676 feet.

Casing Record—16-inch, 34 feet 9 inches; 12½-inch, 347 feet; 10-inch, 961 feet; 8¼-inch, 1316 feet; 6⅝-inch, 1480 feet; 5⅜-inch, 1661 feet.

W. A. McRoberts Well No. 3. Washington Township, Section 7.
Elevation 498.8. Drilling commenced March 24, 1920.

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Soil, dark, soft	1	1	Shale, dark, shelly	35	785
Clay, light, soft	11	12	Shale, dark, soft	78	863
Clay and gravel, light, soft	8	20	Water sand, light, hard...	33	896
Shale, dark, soft	15	35	Shale, dark, soft	39	935
Limestone, light, hard	2	37	Sandstone, light, hard		
Shale, dark, soft	38	75	(Mansfield)	15	950
Limestone, light, hard....	2	77	Shale, dark, soft	49	999
Shale, dark, soft	22	99	Limestone, gray, hard ...	2	1001
Limestone, light, hard	2	101	Shale, dark, soft	44	1045
Shale, dark, soft	90	191	Sandstone, gray, soft	14	1059
Limestone, light, hard ...	2	193	Shale, dark, soft	11	1070
Shale, dark, soft	3	196	Sandstone, light, soft	30	1100
Limestone, light, hard	5	201	Sandstone, light, hard	3	1103
Shale, light, soft	5	206	Sandstone, light, medium		
Limestone, light, hard	2	208	(Tar Springs)	122	1225
Shale, light, soft	12	220	Shale, dark, soft	5	1230
Shale, dark, soft	30	250	Sandstone, light, soft	3	1233
Shale, light, soft	109	350	Shale, dark, soft	1	1234
Sandstone, light, soft	20	370	Sandstone, light, hard ...	4	1238
Coal, black, soft	4	374	Shale, dark, soft	8	1246
Shale, light, soft	76	450	Limestone, gray, hard (Glen		
Shale, dark, soft	168	550	Dean)	2	1248
Limestone, light, hard	2	560	Shale, dark, soft	12	1260
Shale, light, soft	11	571	Gas sand, light, hard	16	1276
Limestone, dark, hard	3	574	Shale, dark, soft	17	1293
Shale, dark, soft	4	578	Limestone, brown, hard		
Limestone, dark, hard	2	580	(Golconda)	7	1300
Shale, light, soft	53	633	Shale, dark, soft (Indian		
Limestone, dark, hard	3	636	Springs)	11	1311
Shale, dark, soft	20	656	Top Hoover sand, gray, limy		
Shale, dark, shell	34	690	(Cypress)	4	1315
Shale, dark, soft	44	734	Shale, dark, soft	2	1317
Limestone, light, hard ...	3	737	Sandstone, gray, soft	9½	1326½
Limestone, dark, soft	13	750	Shale, dark, soft	10½	1337

Water at 77, 870 and 1080 feet. Water, hole filled at 945 and 1105 feet. Gas, top of sand, 1276 feet. Production first 24 hours, 25 barrels.

Casing Record—16-inch, 20 feet; 12½-inch, 60 feet; 10-inch, 633 feet; 8¼-inch, 1000 feet; 6⅝-inch, 1246 feet.

Phoebe Hayden Well No. 1. Washington Township. Section 7. Elevation 557.52 feet. Well completed April 25, 1919.

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Soil, soft	1	1	Shale	5	160
Clay	19	20	Limestone, hard	60	220
Quicksand	8	28	Shale, soft	12	232
Clay	15	43	Limestone, hard	11	243
Limestone, hard	10	53	Shale, soft	5	248
Shale, soft	20	73	Limestone, hard	2	250
Shale	4	77	Shale, soft	5	255
Limestone, hard	2	79	Shale, soft	30	325
Shale, soft	19	98	Shale, soft	10	335
Limestone, hard	6	104	Limestone, hard	5	340
Shale, soft	51	155	Shale, soft	40	380

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Shelly sand and shale, soft	20	400	Limestone, hard	4	869
Limestone, hard	9	409	Sandstone, soft	5	874
Shale, soft	10	419	Shale	6	880
Limestone, hard	4	423	Limestone, hard	4	884
Shale, soft	5	428	Shale, soft	1	885
Sandstone, soft	7	435	Limestone, hard	4	889
Limestone, hard	20	455	Shale, soft	11	900
Limestone, hard	10	465	Sandstone, hard (Mans- field)	50	950
Shale, soft	5	470	Shale, soft	1	951
Sandstone, hard	7	474	Sandstone, hard	39	990
Shale, soft	1	475	Shale, soft	22	1012
Limestone, hard	4	479	Limestone, hard (Siberia)	8	1020
Shale, soft	2	481	Sandstone, soft (Tar Springs)	10	1030
Shale, soft	69	550	Shale, soft	98	1128
Coal, soft	4	554	Sandstone, hard	9	1137
Shale, soft	11	565	Shale, soft	33	1170
Limestone, sandy, hard	8	573	Sandstone, hard	10	1180
Shale, soft	7	580	Shale, soft	10	1190
Shale, soft	20	600	Limestone, hard	5	1195
Limestone, hard	9	609	Sandstone, hard	23	1218
Shale, soft	12	621	Shale, soft	22	1210
Limestone, hard	5	626	Sandstone, hard	5	1245
Shale, soft	3	629	Limestone, hard	7	1252
Limestone, hard	12	641	Shale, soft	8	1260
Shale, soft	7	648	Sandstone, hard	9	1269
Shale, soft	2	650	Shale, soft	1	1270
Shale, soft	26	676	Limestone, hard	2	1272
Shale, soft	29	705	Shale, soft	14	1286
Limestone, hard	5	710	Limestone, hard (Glen Dean)	3	1289
Shale, soft	5	715	Shale, soft (Hardinsburg)	56	1345
Shale, hard	7	722	Sandstone, soft	2	1347
Shale, soft	48	770	Shale, soft	6	1352
Limestone, hard	4	774	Limestone, hard (Glen Siberia)	7	1360
Shale, soft	50	824	Shale, soft (Indian Springs)	14	1374
Shale, soft	6	830	Sandstone, soft (Cypress)	24	1398
Limestone, hard	4	834	Shale, soft	4	1402
Shale, soft	6	840			
Sandstone	5	845			
Shale	4	849			
Sandstone	11	860			
Shale	5	865			

Oil first showing, 1375 feet.

Casing Record—16-inch, 39 feet; 12½-inch, 256 feet; 10-inch, 829 feet; 8¼-inch, 1270 feet.

Phoebe Hayden Well No. 2. Washington Township. Section 7.
Elevation 540.88 feet. Well Completed May 26, 1919.

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Soil, dark, soft	1	1	Shale, light, soft	18	112
Clay, soft, yellow	22	23	Shale, dark, soft	10	122
Shale, dark, soft	14	37	Sandstone, grey, hard	18	140
Shale, light, soft	5	42	Sandstone, light, soft	35	175
Limestone, grey, hard	24	66	Shale, light, soft	20	195
Shale, light, soft	7	73	Coal, soft	6	201
Coal, soft	2	75	Shale, light, soft	21	222
Shale, dark, soft	16	91	Limestone, grey, hard	8	230
Sandstone, grey, hard	3	94	Shale, light, soft	10	240

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Sandstone, white, hard ...	21	261	Shale, dark, soft (Mans- field)	42	1027
Shale, dark, soft	34	295	Limestone, grey, hard (Si- beria)	6	1033
Limestone, grey, hard	3	298	Shale, dark, soft (Tar Springs)	15	1048
Shale, dark, soft	27	325	Shale, black, soft	4	1052
Shale, light, soft	35	360	Shale, dark, soft	15	1067
Sandstone, dark, hard	13	373	Sandstone, light, hard	33	1100
Shale, dark, soft	27	400	Shale, dark, soft	20	1120
Sandstone, light, hard	8	408	Sandstone, light, soft	80	1200
Shale, dark, soft	15	423	Shale, dark, soft	6	1206
Sandstone, grey, hard	22	445	Sandstone, grey, hard	17	1223
Shale, dark, soft	15	460	Shale, dark, soft	2	1225
Shale, light, soft	23	483	Limestone, dark, hard (Glen Dean)	4	1229
Shale, dark, soft	52	535	Shale, dark, soft (Hardins- burg)	14	1243
Shale, black, soft	15	550	Sandstone, light, soft	29	1272
Shale, dark, soft	17	567	Shale, light, soft	14	1286
Coal, soft	5	572	Broken limestone, grey, hard	3	1289
Limestone, grey, hard	4	576	Shale, dark, soft	6	1295
Shale, dark, soft	18	594	Sandstone, dark hard	2	1297
Limestone, grey, hard	9	603	Shale, dark, soft	6	1303
Shale, light, soft	14	617	Broken sandstone, dark, soft	6	1309
Shale, dark, soft	7	624	Sandstone, lighter, hard (Golconda)	15	1324
Limestone, grey, hard	6	630	Shale, dark, soft	15	1339
Shale, light, soft	28	658	Limestone, grey, hard	3	1342
Coal, soft	5	663	Shale, dark, soft (Indian Springs)	18	1360
Shale, light, soft	12	675	Top oil sand, grey, medium. 1360 to 1362		
Shale, dark, soft	2	677	Sandstone, darker, coarser (Cypress)	1362 to 1366	
Limestone, grey, hard	3	680	Sandstone, lighter, finer... 1366 to 1372		
Shale, dark, soft	86	766	Sandstone, dark, brown, coarser	1372 to 1381	
Sandstone, light, hard	4	770			
Shale, dark, soft	5	775			
Sandstone, grey, hard	10	785			
Shale, dark, soft	36	821			
Sandstone, grey, hard	4	825			
Shale, dark, soft	10	835			
Sandstone, grey, soft	5	840			
Shale, dark, soft	45	885			
Sandstone, dark, soft	30	915			
Shale, dark, soft	48	963			
Coal, soft	2	965			
Sandstone, light, soft	20	985			

Gas, just showing, 1313 feet. Gas from 1313 to 1322 feet. Gas standing pressure, 140 feet.

Casing Record—16-inch, 38 feet; 12½-inch, 295 feet; 10-inch, 1029 feet; 8¼-inch, 1286 feet; 6⅞-inch, 1340 feet.

P. Hayden Well No. 3. Washington Township. Section 7. Elevation 574 feet. Well completed June 28, 1919.

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Soil, dark, soft	1	1	Dark shale, soft	17	127
Yellow clay, soft	10	11	Dark grey sandstone, hard.	3	130
Yellow sand, soft	49	60	Dark shale, soft	20	150
Shale, dark	5	65	Grey limestone, hard	55	205
Coal, soft	2	67	White sandstone, medium.	20	225
Shale, soft	4	71	Blue shale, soft	25	250
Limestone, light, hard	2	73	Grey limestone, hard	3	253
Light shale, soft	37	110	Dark shale, soft	9	262

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Light limestone, hard	38	300	Dark shale, soft	5	930
Dark shale, soft	20	320	Dark sandstone, soft	15	945
Coal, soft	3	323	Dark shale, soft	20	965
Shale, dark, soft	7	330	Dark sandstone, hard	19	984
Light shale, soft	70	400	Dark shale, soft	28	1012
Grey limestone, medium ...	10	410	White sandstone, medium..	28	1040
Light shale, soft	10	420	Dark shale, soft	48	1088
Grey sandstone, soft	10	440	Coal, soft	2	1090
Dark shale, soft	9	449	Dark shale, soft	24	1114
Light sandstone, hard	6	455	Light shale, soft	5	1119
Dark limestone, hard	8	463	Light sandstone, hard (Mansfield)	16	1135
Light sandstone, soft	17	480	Dark shale, soft	40	1175
Light shale, soft	45	525	Light sandstone, hard	10	1185
Dark shale, soft	35	560	Dark shale, soft	5	1190
Black shale, soft	7	567	Dark limestone, hard (Si- beria)	3	1193
Dark shale, soft	10	577	Dark shale, soft (Tar Springs)	4	1197
Light shale, soft	13	590	Dark sandstone, hard	73	1270
Dark shale, soft	7	597	Dark shale, soft	2	1272
Grey sandstone, hard	2	599	Brown limestone, hard	2	1274
Shale, dark, soft	4	603	Light sandstone, hard	24	1298
Dark limestone, hard	4	607	Brown limestone, hard (Glen Dean)	4	1302
Coal, soft	5	612	Light sandstone, hard (Hardinsburg)	6	1308
Light sandstone, hard ...	13	625	Dark shale, soft	9	1317
Dark shale, soft	10	635	Grey limestone, shell, hard.	2	1319
Dark limestone, hard	15	650	Dark shale, soft	21	1340
Light shale, soft	15	665	Light gas sand, soft	19	1359
Brown limestone, hard	7	672	Dark shale, soft	10	1369
Light shale, soft	13	685	Grey limestone, hard (Gol- conda)	14	1383
Dark limestone, soft	15	700	Dark shale, soft (Indian Springs)	15	1398
Dark shale, soft	20	720	Hoover oil sand, soft (Cy- press)	5	1403
Dark limestone, hard	5	725	Light sandstone, fine	5	1408
Dark shale, soft	50	775	Grey sandstone, coarser ...	7	1415
Grey sandstone, soft	15	788	Dark shale, soft	10	1425
Dark shale, soft	51	839			
Brown limestone, hard	6	845			
Light shale, soft	10	855			
Grey limestone, hard	5	860			
Grey sandstone, hard	12	872			
Broken sandstone, soft, dark	16	888			
Dark sandstone, hard	37	925			

Water, hole filled at 1280 feet. Gas, first showing, 1357 feet. Oil, first showing, 1400 feet. Oil pay sand from 1398 to 1415 feet. Production first 24 hours, 3 barrels.

Casing Record—16-inch, 33 feet; 12½-inch, 250 feet; 10-inch, 839 feet; 8¼-inch, 1298 feet.

Phoebe Hayden Well No. 4. Washington Township. Section 7. Elevation 534.62 feet. Well completed January 1, 1920.

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Soil, dark, soft	1	1	Limestone, light, hard	2	100
Clay, yellow, soft	20	21	Shale, dark, soft	33	133
Gravel, yellow, soft	9	30	Limestone, light, hard	12	145
Shale, light, soft	9	39	Shale, dark, soft	55	200
Sandy shell, medium	2	41	Coal, soft	3	203
Shale, dark, soft	57	98	Limestone, light, medium..	3	206

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Shale, light, soft	16	222	Shale, dark, soft	33	870
Limestone, light, hard	6	228	Limestone, light, hard	4	874
Shale, dark, soft	2	230	Limestone, dark, medium..	16	890
Limestone, light, hard	4	234	Sandstone, light, soft		
Shale, dark, soft	5	239	(Mansfield)	27	917
Limestone, light, hard	6	245	Sandstone, light, hard	5	922
Shale, light, medium	20	265	Limestone, light, hard (Si-		
Shale, dark, soft	10	275	beria)	18	940
Coal, black, soft	3	278	Shale, light, soft (Tar		
Shale, dark, shelly	5	283	Springs)	15	965
Shale, dark, soft	67	350	Shale, dark, soft	12	967
Sandstone, light, soft	50	400	Sandstone, light, medium..	18	985
Limestone, light, hard	4	404	Shale, dark, soft	55	1040
Shale, light, soft	45	455	Shale, light, soft	22	1062
Shale, dark, soft	15	470	Sandstone, light, hard	36	1098
Shale, dark, shelly	12	482	Shale, dark, soft	32	1130
Shale, dark, soft	5	487	Sandstone, light, medium..	95	1225
Shale, dark, medium	38	525	Broken sand, grey, soft...	20	1245
Sandstone, light, soft	10	535	Shale, dark, soft	7	1252
Shale, dark, shelly	20	555	Limestone, light, hard		
Shale, grey, soft	5	560	(Glen Dean)	2	1254
Shale, dark, shelly	17	577	Shale, dark, soft	3	1257
Sandstone, blue, hard	5	582	Limestone, light, hard	6	1263
Shale, light, soft	18	600	Shale, light, soft	26	1289
Shale, dark, soft	14	614	Sandstone, light, hard	3	1292
Shale, light, soft	21	635	Shale, dark, soft	4	1296
Shale, dark, soft	5	640	Gas sand, light, hard	16	1312
Coal, black, soft	4	644	Shale, dark, soft	18	1330
Shale, dark, soft	12	656	Limestone, light, hard (Gol-		
Limestone, light, hard ...	4	660	conda)	7	1337
Shale, dark, soft	85	745	Shale, dark, soft (Indian		
Shale, dark, soft	43	788	Springs)	11	1348
Limestone, light, hard	2	790	Hoover sand, grey and		
Shale, dark, soft	10	800	brown, soft	4	1352
Sandstone, light, hard,			Sandstone, grey, soft (Cy-		
broken	27	827	press)	9	1361
Shale, light, brown, soft..	6	833	Shale, dark	5	1366
Limestone, light, hard	4	837			

Water, hole filled up from 39 to 41 feet. Water, hole filled up, 920 feet. Gas, first showing, 1300 feet. Oil, 1350 feet. Production first 24 hours, 37½ barrels.

Casing Record—16-inch, 54 feet; 12½-inch, 281 feet; 10-inch, 917 feet; 8¼-inch, 1258 feet; 6⅝-inch, 1332 feet.

G. W. Colvin Well No. 1. Elevation 508 feet. Washington Township. Section 6. Well completed October 20, 1919.

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Yellow clay, soft	35	35	Dark shale, soft	10	285
Shale, light, soft	10	45	Light sandstone, hard	7	292
Grey limestone, hard	4	49	Shale, dark, soft	3	295
Dark shale, soft	31	80	Light sandstone, hard	5	300
Light limestone, hard	20	100	Dark shale, soft	40	340
Sandstone, light, hard	45	145	Light, limestone, hard ...	10	350
Dark shale, soft	55	200	Sandstone, grey, hard	30	380
Grey limestone, hard	30	230	Light shale, soft	2	382
Light shale, soft	5	235	Grey limestone, hard	13	395
Light limestone, hard	40	275	Light shale, soft	2	397

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Grey limestone, hard	3	400	Dark shale, soft	20	820
Light shale, soft	8	408	Grey limestone, hard	7	827
Grey limestone, hard	10	418	Dark shale, soft	6	833
Light sandstone, soft	7	425	Grey sandstone, hard	2	835
Dark shale, soft	50	475	Dark shale, soft	10	845
Coal, soft	5	480	Grey sandstone, hard	15	860
Light shale, soft	50	530	Dark shale, soft	47	907
Coal, soft	3	533	Grey limestone, hard	3	910
Grey limestone, hard	2	535	Dark shale, soft	23	933
Dark shale, soft	35	570	Grey sandstone, hard	14	947
Light limestone, hard	20	590	Dark shale, soft	8	955
Light shale, soft	10	600	Light sandstone, hard	8	963
Dark shale, soft	90	690	Dark shale, soft	47	1010
Grey sandstone, hard	6	696	Coal I, soft	4	1014
Dark shale, soft	19	715	Light sandstone, hard (Mansfield)	13	1027
Grey limestone, hard	6	721	Dark shale, soft	13	1040
Dark shale, soft	4	725	Grey sandstone, soft	10	1050
Grey limestone, hard	10	735	Dark shale, soft	10	1060
Dark shale, soft	35	770	Brown oil sand, soft	2	1062
Grey sandstone, hard	10	780	Light oil sand, soft	4	1066
Dark shale, soft	15	795			
Grey sandstone, hard	5	800			

Water, 4 bailers per hour at 115 feet. Water, 2 bailers per hour at 300 feet. Water, 2 bailers per hour at 533 feet. Water, 3 bailers per hour at 940 feet. Bad hole from 855 to 865 feet. Oil, first showing, 1060 feet. Production first 24 hours, 12½ barrels.

Casing Record—16-inch, 40 feet; 12½-inch, 246 feet; 10-inch, 954 feet.

Geo. Colvin Well No. 2. Elevation 528 feet. Washington Township. Section 6. Completed June 21, 1920.

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Soil, dark, soft	1	1	Shale, black, soft	5	510
Clay, yellow, soft	20	21	Shale, light, soft	20	530
Shale, dark, soft	54	75	Shale, gray, hard	10	540
Limestone, dark, hard	4	79	Shale, dark, medium	21	561
Shale, light, soft	6	85	Limestone, shell, gray, hard	4	565
Shale, dark, soft	10	95	Shale, light, soft	30	595
Limestone, white, hard ...	15	110	Shale, dark, soft	5	600
Limestone, gray, medium..	20	130	Shale, gray, medium	25	625
Shale, light, soft	10	140	Limestone, shell, gray, hard	3	628
Shale, dark, soft	5	145	Shale, dark, soft	27	655
Shale, light, soft	45	190	Shale, light, medium	10	665
Shale, dark, soft	25	215	Shale, dark, soft	18	683
Sandstone, gray, hard	75	290	Shale, light, medium	17	700
Shale, dark, mud	5	295	Shale, dark, soft	25	725
Sandstone, gray, hard ...	40	335	Shale, dark, medium	30	755
Shale, dark, soft	15	350	Shale, light, soft	15	770
Sandstone, gray, hard	10	360	Shale, dark, soft	10	780
Shale, gray, soft	20	380	Shale, light, medium	10	790
Shale, light, soft	40	420	Limestone, dark, hard ...	15	805
Shale, dark, soft	45	465	Shale, dark, soft	30	835
Shale, black, soft	5	470	Sandstone, gray, soft	25	860
Shale, dark, soft	20	490	Shale, dark, soft	5	865
Limestone, shell, gray, hard	2	492	Sandstone, gray, hard	25	890
Shale, dark, soft	13	505	Shale, dark, soft	25	915

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Water sand, light, soft ...	42	957	Sandstone, dark, soft	7	1021
Limestone, dark, hard	5	962	Shale, dark, soft	20	1014
Shale, gray, soft.....	15	977	Sandstone, gray, soft	6	1027
Shale, dark, soft	3	980	Shale, dark, soft	5	1032
Shale, light, soft	11	991	Oil sand, light, soft	4	1036
Sandstone, gray, soft	3	994			

Production—7½ barrels oil and 5 barrels water first head after filling tubing.

Geo. Colvin Well No. 3. Elevation 554 feet. Washington Township. Section 6. Completed October 8, 1920.

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Clay, yellow, soft	15	15	Shale, light, soft	15	465
Shale, dark, soft	25	40	Shale, dark, soft	10	475
Shale, light, soft	25	65	Limestone, gray, hard	5	480
Sandy limestone, gray, medium	25	90	Shale, light, soft	25	505
Sandy limestone, white, hard	35	125	Limestone, gray, medium..	15	520
Shale, light, soft	10	135	Coal, soft	5	525
Coal VI, soft	1	136	Shale, light, soft	20	545
Shale, dark, soft	44	180	Limestone, brown, hard ...	2	550
Limestone, gray, hard	20	200	Shale, light, soft	20	570
Limestone, gray, hard	20	220	Shale, dark, soft	20	590
Limestone, light, medium..	45	265	Limestone, light, hard	5	595
Limestone, light, hard	10	275	Shale, dark, soft	10	605
Shale, dark, soft	10	285	Limestone, light, hard	15	620
Shale, light, soft	30	315	Shale, dark, soft	5	625
Limestone, gray, hard	15	330	Shale, light, soft	115	750
Limestone, dark, hard	20	350	Limestone, light, medium..	10	760
Shale, dark, soft	5	355	Shale, dark, soft	45	805
Limestone, dark, hard	5	360	Broken sandstone, light, me- dium	5	810
Shale, light, soft	30	390	Shale, dark, soft	40	850
Shale, dark, soft	40	430	Shale, light, medium	13	863
Shale, black, soft	20	450	Sandstone, light, medium, hard, then softened	5½	868' 6"

Water, 5 bailers per hour at 136 feet. Water, 8 bailers per hour at 275 feet. Water, 1 bailer per hour at 550 feet. Oil, first showing, 865 feet. Production first 24 hours, 3¾ barrels.

John Zimmerman Well No. 2. Washington Township. Section 7. Elevation 538.79 feet. Completed February 13, 1919.

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Clay, soft	20	20	Limestone, hard	7	150
Sand, soft	4	24	Shale, soft	63	213
Mud, soft	11	35	Limestone, hard	9	222
Shale, soft	6	41	Shale, soft	3	225
Limestone, soft	2	43	Limestone, hard	9	234
Shale, soft	4	47	Shale, light, soft	12	246
Limestone, soft	3	50	Shale, soft	86	332
Shale, soft	15	65	Sandstone, hard	23	355
Shale, soft	5	70	Shale, soft	30	385
Shale, soft	65	135	Sandstone, hard	15	400
Limestone, hard	4	139	Shale, soft	12	412
Shale, hard	4	143	Shale, soft	53	465

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Shale, soft	20	485	Shale, gritty	12	914
Sandstone, hard	5	490	Coal, soft	2	916
Shale, soft	10	500	Shale, soft	46	962
Shale, soft	18	518	Limestone, hard	6	968
Sandstone, soft	12	530	Sandstone, hard	7	975
Limestone, hard	13	543	Shale, soft	47	1022
Shale, soft	27	570	Limestone, hard (Siberia)	3	1025
Sandstone, hard	9	579	Shale, soft (Tar Springs)	41	1066
Shale, soft	16	595	Sandstone, hard	18	1084
Shale, soft	5	600	Shale, dark, soft	16	1100
Shale, soft	3	603	Sandstone, hard	23	1123
Limestone, hard	6	609	Shale, soft	13	1136
Shale, soft	3	612	Sandstone, hard	129	1265
Sandstone, hard	4	616	Shale, soft	3	1268
Shale, soft	9	625	Limestone, hard (Glen Dean)	4	1272
Shale, soft	32	657	Shale, soft (Hardinsburg)	26	1298
Shale, soft	8	665	Gas sand, soft, coarse	16	1314
Shale, soft	60	725	Shale, soft	14	1328
Sandstone, hard	9	734	Limestone, hard (Golconda)	11	1339
Shale, soft	16	750	Shale, soft	10	1349
Limestone, hard	5	755	Sandstone, soft	3	1352
Shale, soft	5	760	Sandstone, a little coarse..	5	1357
Sandstone, hard	23	783	Sandstone, finer	4	1361
Shale, soft	2	785	Sandstone, coarser (Cy- press)	3	1364
Sandstone, hard	64	849	Sandstone, coarser	7	1371
Shale, soft	15	864	Shale, soft	1	1372
Sandstone, hard	11	875			
Shale, soft	15	890			
Sandstone, gray, hard	12	902			

Gas, first showing, 1300 feet. Oil, first showing, 1352 feet.

Casing Record—16-inch, 41 feet; 12½-inch, 354 feet; 10-inch, 962 feet; 8¼-inch, 1270 feet; 6½-inch, 1328 feet.

J. Zimmerman Well No. 3. Washington Township. Section 7. Elevation 498.43 feet. Completed October 2, 1919.

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Soil, soft, dark	1	1	Broken sandstone, soft, light	20	320
Clay, soft, dark	19	20	Sandstone, soft, gray	45	365
Gravel, soft, gray	2	22	Limestone, hard, gray	4	369
Shale, soft, dark	18	40	Coal V, soft	3	372
Broken limestone, medium, dark	4	44	Broken sandstone, soft, gray	14	386
Shale, soft, dark	54	98	Shale, soft, dark	35	421
Sandstone, hard, gray	16	114	Sandstone, soft, gray	10	431
Shale, soft, dark	43	157	Shale, soft, dark	49	480
Coal, soft	4	161	Shale, soft, brown	11	490
Shale, soft, dark	18	179	Shale, soft, brown	34	525
Limestone, hard, gray	6	185	Limestone, hard, brown ...	10	535
Shale, soft, dark	1	186	Shale, soft, black	5	540
Limestone, hard, gray	5	191	Limestone, hard, gray	6	546
Shale, soft, dark	3	194	Sandstone, soft, gray	10	556
Limestone, hard, gray	6	200	Shale, soft, dark	10	566
Sandstone, soft, gray	9	209	Shale, soft, dark	12	578
Shale, soft, black	31	240	Limestone, hard, gray	5	583
Shale, soft, light	5	245	Shale, soft, light	27	610
Shale, soft, dark	55	300			

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Coal, soft, black	5	615	Sandstone, hard, gray	5	1035
Shale, soft, dark	10	625	Shale, soft, dark	35	1070
Limestone, hard, gray	5	630	Sandstone, hard, gray (Tar Springs)	160	1230
Shale, soft, black	130	760	Shale, soft, dark	15	1245
Sandstone, hard, gray	15	775	Limestone, hard, dark (Glen Dean)	2	1247
Shale, soft, dark	40	815	Shale, soft, light	7	1254
Sandstone, hard, gray	10	825	Sandstone, medium, gray...	4	1258
Shale, soft, gray	5	830	Shale, soft, dark	7	1265
Sandstone, soft, gray	20	850	Gas sand, medium, gray...	14	1279
Shale, soft, dark	15	865	Shale, soft, dark	16	1295
Sandstone, hard, gray (Mansfield)	30	895	Limestone, hard, gray (Gol- conda)	11	1306
Limestone, hard, brown ...	5	900	Shale, soft, dark (Indian Springs)	11	1317
Shale, soft, black	8	908	Hoover sand, medium, gray (Cypress)	18	1335
Limestone, hard, gray	4	912	Shale, soft, dark	2	1337
Shale, soft, black	13	925	Limestone, hard, gray ...	2	1339
Sandstone, soft, gray	14	939	Shale, soft, dark	9	1348
Shale, soft, dark	62	1001			
Shale, soft, black	3	1004			
Shale, soft, dark	12	1016			
Sandstone, hard, gray	9	1025			
Shale, soft, dark	5	1030			

Water, 1 bailer per hour at 44, 360 and 850 feet. Water, 3 bailers per hour at 895 feet. Bad hole from 1100 to 1110 feet. Gas, top of sand, 1265 feet. Gas, first showing, 1267 feet. Oil, first showing, 1320 feet. Production, pumped 50 barrels first head; first 24 hours, 20 barrels.

Casing Record—16-inch, 39 feet; 12½-inch, 260 feet; 10-inch, 868 feet; 8¼-inch, 1245 feet; 6½-inch, 1295 feet.

J. Zimmerman Well No. 4. Washington Township. Section 7. Elevation 507.98 feet. Completed September 3, 1919.

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Soil, soft	1	1	Light sandstone, hard	25	385
Yellow clay, soft	11	12	Black limestone, hard	7	392
Shale, light, soft	42	54	Dark shale, soft	5	397
Dark shale, soft	19	73	Light shale, soft	8	405
Dark sand, hard	10	83	Light sandstone, hard	9	414
Dark shale, soft	25	108	Light shale, soft	48	462
Dark limestone, hard	2	110	Dark shale, soft	38	500
Dark shale, soft	3	113	Black shale, soft	6	506
Gray sandstone, hard	11	124	Gray limestone, hard	4	510
Light shale, soft	3	127	Coal, soft	2	512
Gray limestone, hard	6	133	Dark shale, soft	14	526
Dark shale, soft	37	170	Dark limestone, hard	2	528
Coal, soft	4	174	Dark shale, soft	8	536
Dark shale, soft	23	197	Gray limestone, hard	4	540
Gray limestone, hard	11	208	Coal, soft	7	547
Light shale, soft	17	225	Light shale, soft	25	572
Gray sandstone, hard	8	233	Light sandstone, hard	6	578
Dark shale, soft	61	294	Dark shale, soft	27	605
Gray sandstone, hard	9	303	Light shale, soft	30	635
Dark shale, soft	8	311	Dark shale, soft	15	650
Dark sandstone, hard	3	314	Gray limestone, hard	5	655
Dark shale, soft	11	325	Light shale, soft	10	665
Dark sandstone, hard	33	358	Dark shale, soft	111	776
Dark shale, dark	2	360	Gray limestone, hard	8	784

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Light shale, soft	13	797	Light sandstone, hard	48	1160
Gray sandstone, hard	11	808	Light shale, soft	15	1175
Dark shale, soft	30	838	Light sandstone, hard	37	1212
Light sandstone, hard	24	862	Light shale, soft	5	1217
Brown limestone, hard ...	3	865	Gray sandstone, hard	29	1246
Light sandstone, soft	7	872	Dark shale, soft	4	1250
Dark shale, soft	2	874	Light shale, soft (Glen Dean)	21	1271
Dark sandstone, hard (Mansfield)	36	910	Dark limestone, hard	2	1273
Gray sandstone, hard	7	917	Dark shale, soft	7	1280
Light shale, soft	13	930	Dark sandstone, hard	8	1288
Dark shale, soft	12	942	Dark shale, soft	2	1290
Light sandstone, hard	8	950	Light sandstone, hard	5	1295
Dark shale, soft	5	955	Light shale, soft	4	1299
Light sandstone, hard	5	960	Light sandstone, hard	4	1303
Dark shale, soft	52	1012	Dark shale, soft	11	1314
Light sandstone, hard	8	1020	Gray sandstone, hard	2	1316
Dark shale, soft	5	1025	Brown limestone, hard (Golconda)	8	1324
Gray sandstone, hard	8	1033	Dark shale, soft (Indian Springs)	12	1336
Light sandstone, hard	9	1042	Hoover sandstone (Cy- press)	17	1353
Dark shale, soft	8	1050	Dark shale, soft	8	1361
Gray limestone, hard (Si- beria)	2	1052			
Light shale, soft (Tar Springs)	60	1112			

Water, 2 bailers per hour at 385 feet. Water, hole filled up at 895 feet. Gas, little showing at 1314 feet. Oil, first showing at 1338 feet. Production first 24 hours, 3¾ barrels.

Casing Record—16-inch, 48 feet; 12½-inch, 311 feet; 10-inch, 862 feet; 8¼-inch, 1284 feet.

John Zimmerman Well No. 5. Washington Township. Section 7. Elevation 526.36 feet. Completed March 28, 1920.

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Mud, yellow, soft	15	15	Shale, dark, soft	3	383
Gravel, yellow, soft	10	25	Limestone, light, hard	10	393
Shale, light, soft	6	31	Shale, light, soft	7	400
Limestone, light, hard	5	36	Limestone, white, hard ...	10	410
Shale, dark, soft	37	73	Shale, light, soft	35	445
Shale, light, soft	52	125	Shale, dark, soft	53	498
Limestone, light, hard	6	131	Shale, light, soft	27	525
Shale, light, soft	67	198	Limestone, light, hard ...	10	535
Limestone, white, hard ...	7	205	Shale, light, soft	5	540
Shale, light, soft	9	214	Shale, light, soft	10	550
Limestone, white, hard ...	11	225	Shale, light, soft	5	555
Sandstone, gray, hard	5	230	Shale, dark, soft	4	559
Shale, dark, soft	18	248	Limestone, gray, hard	11	570
Coal, soft	3	251	Shale, light, soft	20	590
Shale, light, soft	2	253	Shale, dark, soft	8	598
Limestone, gray, hard	22	275	Limestone, gray, hard	4	602
Shale, dark, soft	20	295	Shale, light, soft	18	620
Sandstone, gray, hard	5	300	Shale, dark, soft	10	630
Shale, dark, soft	30	330	Shale, light, soft	12	642
Sandstone, light, soft	18	348	Limestone, light, hard	10	652
Shale, dark, soft	3	351	Shale, light, soft	5	657
Sandstone, gray, soft	29	380	Shale, dark, soft	12	669

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Sandstone, light, hard	8	677	Shale, dark, soft (Tar Springs)	2	1052
Shale, dark, soft	35	712	Sandstone, light, hard	17	1069
Limestone, gray, hard	12	724	Shale, dark, soft	5	1074
Shale, light, soft	10	734	Limestone, gray, hard	41	1115
Shale, dark, soft	11	745	Sandstone, gray, hard	79	1194
Limestone, gray, hard ...	29	774	Shale, light, soft	2	1196
Shale, light, soft	5	779	Limestone, light, hard	4	1200
Limestone, gray, hard	3	782	Sandstone, light, hard	59	1259
Shale, light, soft	38	820	Shale, dark, soft	1	1260
Sandstone, light, hard	20	840	Limestone, dark, hard		
Limestone, light, hard	20	860	(Glen Dean)	3	1263
Shale, dark, soft	29	889	Shale, dark, soft	6	1269
Limestone, gray, hard	9	898	Sandstone, dark, soft	1	1270
Sandstone, gray, hard	18	916	Shale, light, soft	10	1280
Shale, dark, soft	3	919	Gas sand, gray, soft	17	1297
Limestone, light, hard	10	929	Shale, dark, soft	13	1310
Shale, light, soft	5	934	Limestone, gray, hard (Golconda)	14	1324
Shale, dark, soft	16	950	Shale, dark, soft (Indian Springs)	11	1335
Sandstone, gray, hard			Sandstone, limy, coarse, gray, soft (Cypress)...	5	1340
(Mansfield)	30	980	Hoover sand, gray, soft..	20	1360
Shale, dark, soft	31	1011	Shale, dark, soft	6	1366
Limestone, white, hard	16	1027			
Shale, dark, soft	5	1032			
Hoover sand, gray, hard (Siberia)	18	1050			

Water, 1½ bailers full per hour at 390 feet. Water, 1 bailer full per hour at 830 feet. Water, filled up at 916 feet. Bad hole from 1200 to 1257 feet. Gas, top of sand, 1280 feet. Gas from 1287 to 1297 feet. Oil, first showing, 1343 feet. Production, 75 barrels first head. Production first 24 hours, 40 barrels.

J. Zimmerman Well No. 6. Washington Township. Section 7. Elevation 490.16 feet. Well completed May 22, 1920.

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Clay, yellow, soft	10	10	Limestone, gray, hard	15	370
Shale, light, soft	5	15	Shale, light, soft	30	400
Quick sand, yellow, soft..	5	20	Shale, dark, soft	20	420
Shale, light, soft	30	50	Sandstone, gray, hard	10	430
Shale, dark, soft	15	65	Shale, dark, soft	45	475
Coal, black, soft	3	68	Coal, black, soft	5	480
Limestone, gray, hard	20	88	Shale, light, soft	5	485
Shale, light, soft	52	140	Limestone, light, hard	1	486
Coal, black, soft	6	146	Shale, dark, soft	2	488
Shale, light, soft	7	153	Limestone, light, hard	2	490
Limestone, light, hard	10	163	Shale, dark, soft	6	496
Shale, dark, soft	7	170	Coal, dark, soft	6	502
Limestone, gray, hard	6	176	Shale, light, soft	4	506
Shale, light, soft	4	180	Limestone, light, hard	6	512
Shale, dark, soft	30	210	Shale, light, soft	5	517
Sandstone, light, hard	10	220	Shale, dark, soft	8	525
Shale, dark, soft	38	258	Sandstone, gray, hard	12	537
Limestone, light, hard	32	290	Shale, dark, soft	12	549
Sandstone, light, hard	20	310	Limestone, light, hard	2	551
Shale, dark, soft	15	325	Coal, black, soft	4	555
Sandstone, light, hard	25	350	Limestone, light, hard	2	557
Shale, light, soft	5	355	Shale, dark, soft	5	562

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Limestone, light, hard	2	564	Limestone, dark, hard (Si-beria)	5	1045
Shale, light, soft	16	580	Sandstone, gray hard (Tar Springs)	5	1050
Shale, dark, soft	8	588	Limestone, gray, hard	10	1060
Coal, black, soft	4	592	Sandstone, gray, hard	22	1082
Shale, light, soft	10	602	Water sand, white, hard...	18	1100
Limestone, light, hard	13	615	Sandstone, gray, hard	114	1214
Shale, dark, soft	65	680	Shale, dark, soft	3	1217
Limestone, dark, hard	7	687	Limestone, brown, hard (Glen Dean)	3	1220
Shale, light, soft	5	692	Shale, dark, soft	6	1226
Sandstone, light, hard ...	6	698	Limestone, gray, hard ...	19	1245
Shale, light, soft	5	703	Gas sand, light, hard	17	1262
Limestone, dark, hard	22	725	Shale, dark, soft	12	1274
Shale, dark, soft	5	730	Limestone, gray, hard (Golconda)	11	1285
Limestone, light, hard	25	755	Shale, light, soft (Indian Springs)	10	1295
Sandstone, dark, hard	25	780	Limestone, sandstone, dark, hard (Cypress)	5	1300
Limestone, dark, hard	5	785	Top Hoover sand, gray, lime, soft	5	1305
Sandy limestone, dark, hard	75	860	Sandstone, a little coarser, gray, hard	6	1316
Shale, dark, soft	35	895	Shale, dark, soft	13	1329
Sandstone, dark, hard (Mansfield)	15	910			
Shale, dark, soft	33	943			
Limestone shale, brown, hard	5	948			
Shale, dark, soft	30	978			
Sandstone, light, hard	27	1005			
Shale, dark, soft	35	1040			

Water, 6 bailers per hour at 330 feet. Hole filled up, 910 and 1214 feet. Gas, first showing, 1251 feet. Gas from 1251 to 1262 feet. Oil, first showing, 1310 feet. Production first 24 hours, 10 barrels.

Casing Record—12½-inch, 21 feet; 10-inch, 721 feet; 8¼-inch, 1100 feet; 6⅝-inch, 1217 feet.

John Zimmerman Well No. 7. Washington Township. Section 7. Elevation 506.36 feet. Well completed January 31, 1921.

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Soil, dark, soft	1	1	Shale, very dark, soft	5	373
Clay, yellow, soft	29' 11"	30' 11"	Shale, light, soft	52	425
Clay, light, soft	16	47	Shale, dark, soft	20	445
Shale, dark, soft	10	116	Shale, light, soft	17	462
Sandstone, gray, soft	14	130	Shale, dark, soft	8	470
Shale, dark, soft	34	164	Limestone, dark, hard ...	1	471
Coal, soft	2	166	Coal, soft	2	473
Shale, dark, soft	22	188	Shale, dark, soft	6	479
Limestone, gray, hard	5	193	Shale, light, soft	11	490
Shale, light, soft	9	202	Shale, dark, soft	22	512
Limestone, light, soft	10	212	Shale, light, soft	5	517
Shale, light, soft	2	214	Coal, soft	4	521
Limestone, light, soft	7	221	Shale, dark, soft	9	530
Shale, dark, soft	32	253	Shale, light, soft	5	535
Limestone, light, hard	1	254	Shale, dark, soft	12	547
Coal, soft	3	257	Limestone, light, hard	3	550
Shale, dark, soft	36	293	Shale, light, soft	20	570
Sandstone, light, soft	3	296	Limestone, light, hard	2	572
Shale, dark, sandy, soft...	43	339	Coal, soft	2	574
Sandstone, light, soft	27	366	Shale, dark, soft	5	579
Limestone, dark, hard	2	368	Limestone, light, hard	4	583

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Shale, light, soft	28	611	Sandstone, light, soft (Tar Springs)	31	1129
Shale, dark, soft	5	616	Limestone, light, hard	5	1134
Shale, light, soft	15	631	Shale, light, soft	2	1136
Limestone, light, hard	2	633	Sandstone, light, soft	22	1158
Shale, dark, soft	5	670	Sandstone, light, hard	24	1182
Limestone, light, hard	1	671	Shale, dark, soft	2	1184
Shale, dark, soft	11	682	Limestone, light, hard	5	1189
Shale, light, soft	23	705	Shale, dark, soft	2	1191
Shale, dark, soft	55	760	Sandstone, light, hard	14	1205
Shale, dark, soft	87	847	Sandstone, light, soft	35	1240
Shale, dark, soft	12	850	Shale, dark, soft	8	1248
Sandstone, dark, soft	4	863	Limestone, dark, hard (Glen Dean)	4	1252
Sandstone, light, hard	27	890	Shale, dark, soft	12	1264
Shale, light, soft	10	900	Shale, dark, shelly	8	1272
Shale, dark, shelly, soft..	5	905	Gas, sand, light, soft	15	1287
Sandstone, light, soft	27	932	Shale, dark, soft	14	1301
Sandstone, light, soft (Mansfield)	14	946	Limestone, light, hard (Golconda)	13	1314
Shale, dark, soft	64	1010	Shale, dark, soft (Indian Springs)	9	1323
Shale, light, soft	5	1015	Top sand, coarse, soft, gray, broken	5	1328
Sandstone, light, hard	16	1031	Sandstone, dark gray, soft (Cypress)	15	1343
Shale, dark, soft	12	1043	Shale, dark, soft	13' 6"	1356' 6"
Shale, dark, soft	20	1063			
Sandstone, light, hard	8	1071			
Sandstone, dark, soft	5	1076			
Sandstone, light, soft	14	1080			
Shale, light, soft	6	1096			
Limestone, light, hard (Siberia)	2	1098			

Water, 1 bailer per hour at 360 feet. Water, 2 bailers per hour at 863 feet. Water, hole filled up at 890 and 940 feet. Gas, first showing, 1277 feet. Oil, first showing, 1330 feet. Production first 24 hours, 17½ barrels.

Hatfield-Colvin Line Well No. 1. Section 6. Elevation 497 feet. Well completed March 1, 1919. Gas well, rock pressure 525 pounds.

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Dark soil, soft	5	5	Black shale, soft	15	470
Yellow clay, soft	20	25	Light shale, soft	18	488
Dark shale, soft	55	80	Gray sandstone, hard	5	493
Light shale, soft	8	88	Dark shale, soft	12	505
Gray limestone, hard	7	95	Gray limestone, hard	10	515
Gray sandstone, hard	43	138	Coal, soft	4	519
Dark shale, soft	57	195	Light shale, soft	6	525
Gray sandstone, hard	20	215	Dark shale, soft	20	545
Coal, soft	2	217	Light shale, soft	15	560
Dark shale, soft	7	224	Gray limestone, hard	5	565
Dark sandstone, soft	36	260	Light shale, soft	15	580
Dark shale, soft	45	305	Dark shale, soft	20	600
Dark sandstone, soft	27	332	Light shale, soft	22	622
Gray sandstone, hard	13	345	Gray limestone, hard	8	630
Light shale, soft	7	352	Dark shale, soft	50	680
Dark sandstone, hard	10	362	Gray limestone, hard	10	690
Dark shale, soft	8	370	Dark shale, soft	25	715
Gray limestone, hard	18	388	Dark shale, soft	62	777
Light shale, soft	17	405	Gray limestone, hard	3	780
Dark shale, soft	50	455	Dark shale, soft	36	816

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Gray limestone, hard	12	828	Brown sandstone, soft	4	1299
Dark shale, soft	22	850	Brown sandstone, soft, broken (Cypress)	17	1316
Gray limestone, gritty	10	860	Dark shale, soft	18	1334
Dark shale, soft	90	950	Dark limestone, hard	3	1337
Light sandstone, hard	50	1000	Dark shale, soft	14	1351
Dark shale, soft	51	1051	Gray sandstone, soft	30	1381
Light limestone, hard (Siberia)	5	1056	Gray limestone, hard (Beech Creek)	16	1397
Light shale, soft (Tar Springs)	12	1068	Dark shale, soft	16	1413
Light sandstone, soft	127	1195	Red rock, soft	2	1415
Dark shale, soft	5	1200	Dark shale, soft (Elwren) ..	48	1463
Light sandstone, hard	10	1210	Sandstone, light, soft	5	1468
Dark shale, soft	20	1230	Shale, dark, soft	10	1478
Gray limestone, hard (Glen Dean)	5	1235	Limestone, hard (Reelsville)	7	1485
Dark shale, soft (Hardinsburg)	16	1251	Shale, dark (Sample)	14	1499
Brown limestone, hard	4	1255	Sandstone, coarse, gas	5	1504
Dark shale, soft	15	1270	Sandstone, lighter	1	1505
Gray limestone, hard	10	1280	Sandstone, coarse, soft ...	6	1511
Dark shale, soft	12	1292	Sandstone, fine, soft	6	1517
Gray limestone, hard, sandy (Golconda)	3	1295			

Casing Record—16-inch, 37¾ feet; 12½-inch, 227 feet; 10-inch, 805 feet; 8¼-inch, 1230 feet; 6⅝-inch, 1335 feet; 5⅜-inch, 1517 feet.

W. A. McRoberts Well No. 1. Washington Township. Section 6. Elevation 510 feet. Well completed May 12, 1918.

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Yellow clay, hard	4	4	White limestone, hard	8	525
Brown clay, hard	40	44	White shale, soft	35	560
Blue shale, soft	23	67	Black shale, soft	6	566
White limestone, hard	6	73	Coal, soft	4	570
White shale, hard	7	80	White shale, soft	5	575
Blue limestone, hard	5	85	White limestone, hard	7	582
White shale, soft	7	92	Green mud	8	590
White limestone, hard	18	110	White shale, soft	30	620
White shale, soft	32	142	Blue limestone, hard	2	622
Coal, soft	4	146	Blue shale, soft	8	630
White shale, soft	19	165	Brown shale, soft	15	645
White limestone, hard	10	175	Black shell, hard	4	649
White shale, soft	10	185	Gray shale, soft	21	670
White limestone, hard, sandy	5	190	Brown shale, hard	4	674
Blue mud, soft	20	210	Blue shale, soft	26	700
Blue shell, hard, soft	70	280	Blue sandstone, hard	30	730
Blue shale, soft	30	310	White shale, soft	45	775
White shale, soft	5	315	Brown sandstone, soft ...	12	787
White shale, soft	45	360	Black shale, soft	38	825
Blue limestone, hard	15	375	Blue limestone, hard	4	829
White shale, soft	40	410	White shale, soft	21	850
Blue limestone, hard	3	413	Gray sandstone, soft	10	860
Blue shale, soft	62	475	White shale, soft	24	884
White shale, soft	15	490	Blue limestone, hard	8	892
Brown shale, soft	15	505	Blue sandstone, soft, water (Mansfield)	33	925
White shale, soft	12	517	Black shale, soft	35	960

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
White limestone, hard	7	967	Blue limestone, hard	5	1340
Black shale, soft	38	1005	Dark sandstone, medium (Cypress)	90	1430
White sandstone, soft	35	1040	Gray limestone, hard (Beech Creek)	15	1445
Black shale, soft	10	1050	Gray shale, soft	10	1455
Brown limestone, hard (Si- beria)	4	1054	Black shale, hard (Elwren)	27	1482
White shale, soft (Tar Springs)	10	1064	Gray limestone, hard (Reels- ville)	3	1485
White sandstone, soft	12	1076	White shale, soft (Sample)	5	1490
Black shale, soft	15	1091	White shale, soft	4	1494
White sandstone, soft	20	1111	Black shale, soft	6	1500
White limestone, hard	10	1121	Black limestone, hard	6	1506
White shale, soft	29	1150	Black shale, soft	2	1508
White sandstone, salt	35	1185	Brown limestone, hard (Beaver Bend)	8	1516
White limestone, hard (Glen Dean)	35	1220	Black shale, soft	8	1524
Dark shale, hard (Hardins- burg)	60	1280	(Mooretown)	5	1529
Gray limestone, hard (Gol- conda)	2	1282	Gray sandstone, soft		
Black shale, soft	5	1287	Brown sandstone, hard ...	3	1532
Dark sandstone, hard	10	1297	Blue sandstone, hard	1	1533
Blue limestone, hard	3	1300	Shale, black, soft.....	4	1537
White shale, soft (Indian Springs)	35	1335	Sandstone, light, crystals..	48	1585
			Sandstone, light, crystals..	10	1596

Water Record—Water at 73, 95, 375, 582 feet. Water, hole filled at 892 and 1595. Oil sand (Mooretown) to 1529. Well plugged.

Casing Record—16-inch casing, 22 feet; 12½-inch casing, 320 feet; 10-inch casing, 884 feet; 8¼-inch casing, 1280 feet; 6⅝-inch casing, 1502 feet.

WELL LOGS FROM MT. OLYMPUS POOL.

The following are the logs from some of the wells in Mt. Olympus pool. The stratigraphical interpretation is the work of the writer.

Sallie Cunningham Well No. 1. Donation 122. Elevation 444 feet. Well completed August 12, 1916.

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Mud and clay	10	10	Black shale, soft	10	335
Brown slate	20	30	Brown shale, soft	50	385
Sand and gravel	10	40	Limy shale, hard	20	405
White grit, hard	40	80	Brown shale, soft	40	445
Slate and shale, hard, blue	60	140	Black shale, soft	10	455
Black shale, white	15	155	Brown shale, soft	14	469
Coal	4	159	Blue shale, soft	13	482
White shale, hard	20	179	Black shale	10	492
Black shale, soft	10	180	Brown shale	30	522
White shale, hard	15	204	Black shale	35	557
Black shale, soft	15	219	Brown shale	23	580
White shale, hard	20	239	Light shale, hard	6	586
Black shale, soft	20	259	Brown shale, soft	14	600
Brown shale	30	289	Light shale	30	630
White shale, hard	30	319	Black shale	40	670
White shale, soft	6	325	Sandstone	6	676

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Black shale	24	700	Dark limestone, hard	12	1105
Light shale	15	715	Light limestone, hard	20	1125
Dark shale	50	765	Dark sandstone, soft	12	1137
Light shale, hard	3	768	Light sandstone, water ...	13	1150
Dark shale	35	803	Dark limestone, hard	20	1170
Light sandstone, hard	15	818	Cavy shale, soft	26	1196
Blue shale, soft	40	858	Dark limestone, hard	4	1200
Light sandstone, hard	17	875	Dark shale, soft	9	1209
Blue shale, soft	25	900	Light limestone, soft, brok-		
Lime shale, hard	3	903	en	16	1225
Blue shale, soft	25	928	Light shale, soft	11	1236
Blue shale	12	940	Light sandstone, soft, water	13	1249
Blue shale	12	952	Gray limestone, hard (Glen		
Light shale, hard	3	955	Dean)	51	1300
Light shale, hard	5	960	Brown limestone, hard ...	18	1318
Dark shale, soft	5	965	Dark shale, soft	15	1333
Sandstone, hard (Mans-			Limestone, hard (Gol-		
field)	10	975	conda)	32	1365
Sandstone, hard	10	985	Light sandstone, soft	35	1400
Light shale, soft	4	989	Light sandstone (Cypress)	21	1421
Gray limestone, hard	2	991	Limestone, hard (Beech		
Light limestone	12	1003	Creek)	8	1429
Dark shale	6	1009	Red rock	4	1433
Light limestone (Siberia).	11	1020	Dark shale	7	1440
Light shale (Tar Springs)	4	1024	Limestone, hard	12	1452
Lime shell	7	1031	Blue shale (Elwren)	21	1473
Brown limestone, hard	9	1040	Limestone (Reelsville)	3	1476
Light shale, soft	1	1041	Light shale (Sample)	6	1482
Light limestone, hard	22	1063	Limestone (Beaver Bend) .	23	1505
Light limestone, hard	30	1093	Sandstone (Mooretown) ...	20	1525

Water ($\frac{1}{2}$ bailer), 586 feet. Water, 600 feet. Water (hole filled with salt water), 975 feet; Oil and gas, 1508 feet. Production first 24 hours, 30 barrels. Production second 24 hours, 20 barrels. Production third 24 hours, 10 barrels. Production fourth 24 hours, 30 barrels.

Casing Record—12 $\frac{1}{2}$ -inch, 569 feet; 10-inch, 985 feet; 8 $\frac{1}{4}$ -inch, 1196 feet; 6 $\frac{5}{8}$ -inch, 1467 feet.

Sallie Cunningham No. 2. Donation 117. Elevation 468.54 feet. Well completed June 28, 1917.

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Yellow clay, soft	7	7	Dark shale, soft	35	510
Yellow mud, sandy	21	28	White limestone, hard	10	520
Dark shale, soft	77	105	Dark shale, soft	10	530
White mud, soft	50	155	Light limestone, hard	10	540
Gray shale, soft	78	238	Light shale, soft	20	560
Gray limestone, soft	12	250	Dark shale, soft	15	575
White limestone, hard	10	260	Light shale, soft	13	588
Dark shale, soft	40	300	Coal, soft	5	593
White sandstone, water...	20	320	Light shale, soft	12	605
Brown shale, soft	24	344	Dark shale, soft	7	612
Dark limestone, hard	3	347	Light shale, soft	18	630
Dark shale, soft	13	360	Dark shale, soft	30	660
Light shale, soft	75	435	Dark limestone, broken....	10	670
Dark shale, soft	25	460	White limestone, hard	10	680
Light shale, soft	10	470	White limestone, broken ..	10	690
Gray limestone, hard	5	475	Dark shale	40	730

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Dark lime tone, hard	10	740	White sandstone	65	1190
Light limestone, hard	20	760	Dark shale	2	1192
Dark shale	10	770	Dark limestone, hard	3	1195
Dark limestone, hard	5	775	Dark shale	13	1208
Dark shale	20	795	Gray limestone, hard	4	1212
Light shale	5	800	Dark shale	8	1220
White limestone, hard	20	820	Gray limestone, hard	8	1228
White shale	10	830	Dark shale	2	1230
Light sandstone, empty ...	15	845	Gray limestone, hard (Glen Dean)	33	1263
Dark shale	5	850	Light shale	2	1265
Gray limestone, hard	5	855	White sandstone, empty ...	5	1270
Light shale	12	867	Dark shale	15	1285
Dark limestone, hard	5	872	Dark limestone, hard	21	1306
Dark shale	13	885	Brown limestone, hard (Golconda)	44	1350
Light shale	10	895	Dark shale	10	1360
Dark shale, muddy	17	912	Gray sandstone (Cypress) .	80	1440
White sandstone, water ...	10	922	Light shale	3	1443
Dark shale	75	997	Red rock, soft (Beech Creek)	4	1447
Gray sandstone, hard	14	1011	Dark shale (Elwren)	50	1497
Dark shale	5	1016	Gray limestone, hard (Reel'sville)	3	1500
White sandstone	28	1044	Brown limestone, hard	11	1511
Light shale	9	1053	Dark shale (Sample)	2	1513
Light limestone, hard	1½	1054½	Light sandstone, oil	37	1550
Light shale	10½	1065			
Dark limestone, hard	37	1102			
Light shale	10	1112			
Dark limestone	8	1120			
Dark shale	5	1125			

Water, 305 feet. Water (little), 680 feet. Water (hole filled up), 865, 1128 and 1318 feet. Oil, best pay, 1518 to 1536 feet. Production first 14 hours, 42½ barrels. Production second 24 hours, 90 barrels. Production third 6 hours, 35 barrels. Production fourth 12 hours, 12½ barrels.

Casing Record—12½-inch, 365 feet; 10-inch, 1070 feet; 8¼-inch, 1242 feet; 6⅝-inch, 1510 feet.

Sallie Cunningham No. 4. Donation 122. Elevation 454 feet. Well completed September 4, 1917.

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Soil, dark	7	7	Dark sandstone	18	253
Yellow clay, sandy	23	30	Dark shale	7	260
Yellow sand, gravelly.....	6	36	Coal, soft	4	264
Dark shale, sandy	3	39	Dark shale, soft	8	272
Dark shale	54	93	Dark sandstone, soft	4	276
Gray sandstone	2	95	Dark shale, soft	4	280
Dark shale	5	100	Dark limestone, hard	15	295
Dark sandstone	5	105	White sandstone, soft	15	310
Dark shale	5	110	Blue shale, soft	24	334
Light sandstone	30	140	Coal, soft	3	337
Dark shale	25	165	Light shale, soft	33	370
Dark limestone	5	170	Dark shale, soft	45	415
Dark shale	15	185	Dark sandstone, soft	4	419
Dark sandstone	8	193	Dark shale, soft	14	430
Dark shale	27	220	Light shale, soft	40	470
Light shale	10	230	Gray limestone, hard	10	480
Dark shale	5	235	Dark shale, soft	20	500

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Dark sandstone, soft	5	505	Dark shale	6	1043
Dark shale, soft	15	520	Limestone	17	1060
Dark sandstone, soft	5	525	White sandstone	18	1078
Light shale, soft	10	535	Dark shale (Buffalo Wal-		
Dark shale, soft	10	545	low)	12	1090
Gray limestone, hard	10	555	Gray limestone (Siberia) ..	10	1100
Light shale, hard	20	575	Sandstone (Tar Springs) .	5	1105
Coal, soft	5	580	Gray limestone	10	1115
Brown shale, soft	10	590	White sandstone, water...	65	1180
Light shale, soft	35	625	Dark shale	16	1196
Light limestone, hard	5	630	Light limestone, hard (Glen		
Light shale, soft	15	645	Dean)	8	1204
White limestone, hard	10	655	Light shale	8	1212
Light sandstone	20	675	Gray limestone, hard	19	1231
Light shale	70	745	Dark shale (Hardinsburg) .	9	1240
White, limestone, hard	10	755	Gray limestone, hard	10	1250
Dark shale	10	765	White sandstone	15	1265
White sandstone	15	780	Gray limestone	5	1270
Dark shale	20	800	Dark shale	5	1275
Dark sandstone	5	805	Gray limestone	3	1278
Dark shale	15	835	Light limestone (Golconda)	42	1320
Dark shale	10	845	Light shale (Indian		
Blue limestone, hard	5	850	Springs)	38	1358
Black shale	5	855	Light limestone	2	1360
White sandstone	15	870	White sandstone, water		
Dark shale	5	875	(Cypress)	68	1428
White limestone, hard	10	885	Gray limestone (Beech		
White shale	5	890	Creek)	7	1435
White limestone, hard	5	895	Light shale	5	1440
Black shale	10	905	Red rock	2	1442
White sandstone	15	920	Dark shale (Elwren)	36	1478
Black shale	42	962	Gray limestone, hard (Reels-		
Dark limestone	10	972	ville)	3	1481
Light sandstone	12	984	Dark shale	9	1490
Dark shale	3	987	Hole under-reamed to 1490 ;		
Gray limestone	17	1004	6½" set at 1490 on brown		
Dark shale	6	1010	limestone.		
Dark shale	6	1016	Brown limestone	10	1500
Gray limestone	3	1019	Dark shale (Sample)	4	1504
Dark shale	6	1025	Sandstone, oil	28	1532
White sandstone	12	1037			

Water (6 bailers per hour), 93 feet. Water (3 more bailers), 253 feet. Water (hole filled up), 970, 1065 and 1428 feet. First showing of oil, 1512 feet. Best pay, 1511 to 1515 feet. Pay sand, 1515 to 1530 feet. Production first 24 hours, 130 barrels. Production second 24 hours, 50 barrels. Production third 24 hours, 62½ barrels.

Casing Record—16-inch, 36 feet; 12½-inch, 349 feet; 10-inch, 987 feet; 8½-inch, 1278 feet; 6½-inch, 1490 feet.

Sallie Cunningham No. 7. Donation 122. Elevation 459.51 feet. Well completed April 25, 1918.

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Dark soil, soft	1	1	Blue shale, soft	20	80
Yellow clay, soft	28	29	White limestone, soft	5	85
Blue shale, soft	17	46	Dark shale, soft	71	156
Dark shale, soft	14	60	Coal, soft	4	160

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Dark shale, soft	40	200	Gray limestone, hard	8	991
Light sandstone, soft	39	239	Dark shale, soft	14	1005
Dark shale, soft	21	260	Gray limestone, hard	5	1010
Black shale, soft	10	270	Dark shale, soft	15	1025
Light shale, soft	10	280	Gray limestone, hard (Si- beria)	10	1035
White sandstone, soft	40	320	Light sandstone, soft (Tar Springs)	161	1196
Dark shale, soft	34	354	Gray limestone, hard	4	1200
Light limestone, hard	5	359	Dark shale, soft (Glen Dean)	20	1220
Light shale, soft	45	404	Gray limestone, hard	4	1224
Black shale, soft	61	465	Light shale, soft (Hardins- burg)	61	1285
White limestone, hard	10	475	Gray limestone, hard (Gol- conda)	30	1315
Light shale, soft	13	488	Dark shale, soft (Indian Springs)	6	1321
White limestone, hard ...	4	492	Dark sandstone, soft	14	1335
Dark shale, soft	17	509	Dark shale, soft	5	1340
Light limestone, hard	15	524	Dark sandstone, soft	5	1345
Light sandstone, hard	11	535	Light limestone, hard	8	1353
Light shale, soft	10	545	Light sandstone, soft (Cy- press)	87	1440
Dark shale, soft	5	550	Light shale, soft (Beech Creek)	8	1448
Light limestone, hard	3	553	Dark limestone, hard	2	1450
Dark shale, soft	22	575	Dark shale, soft (Elwren)	32	1482
White shale, soft	22	597	Gray limestone, hard (Reelsville)	4	1486
Gray sandstone, soft	28	625	Brown limestone, hard ...	9	1495
Light shale, soft	15	640	Sandstone, gas (Sample)..	6	1501
Gray sandstone, soft	5	645	Sandstone, gas	4	1505
Light shale, soft	8	653	Sandstone, gas	6½	1511½
Light limestone, hard	22	675	Sandstone, oil	4	1519
Dark shale, hard	22	697	Sandstone, gas	6½	1515
Light sandstone, soft	8	705	Sandstone, oil	4	1523
Light shale, soft	35	740	Dark shale, soft	4	1527
Light limestone, hard	7	747	Gray sandstone, hard	15	1542
Light shale, soft	5	752	White sandstone, hard	2	1544
Dark sandstone, soft	43	795			
Light shale, soft	15	810			
Light sandstone, soft					
(Mansfield)	80	890			
Dark sandstone, hard	25	915			
Light sandstone, hard	8	923			
Dark shale, soft	48	971			
Gray limestone, hard	3	974			
Dark shale, soft	9	983			

Water (1 bailer per hour), 85 feet. Water (5 bailers per hour), 240 feet. Water (5 bailers per hour), 600 feet. Water (filled up), 915, 1080 and 1348 feet. First gas, 1495 feet (sample); second gas, 1501 feet. Best pay, 1523 feet.

Casing Record—12½-inch, 354 feet; 10-inch, 973 feet; 8¼-inch, 1221 feet; 6⅝-inch, 1486 feet; 5⅝-inch, 1518 feet 4 inches.

Sallie Cunningham No. 8. Donation 122. Elevation 448.29 feet. Well completed April 26, 1918.

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Dark soil, soft	1	1	Light shale	27	92
Yellow clay, soft	5	6	Gray limestone, hard	2	94
Yellow sand, soft, muddy..	19	25	Light shale, soft	81	175
Dark sand, soft, muddy ..	12	37	Dark shale, soft	18	193
Yellow sand, soft, muddy..	6	43	White sandstone, soft	28	221
White mud, soft, muddy ..	22	65	Dark shale, soft	10	231

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Gray limestone, hard	4	235	Light limestone, hard (Tar Springs)	12	995
Coal, soft	4	239	White sandstone, soft	90	1085
Light shale, soft	20	259	Dark shale, soft	7	1092
White sandstone, hard ...	36	295	White sandstone hard	80	1172
Dark shale, soft	39	334	Dark shale, soft	16	1188
Gray limestone, hard ...	11	345	White limestone, hard ...	2	1190
Light shale, soft	15	360	Dark shale, soft	17	1207
White sandstone, hard ...	5	365	Gray limestone, hard (Glen Dean)	12	1219
Dark shale, soft	70	435	Light sandstone, hard (Hardinsburg)	11	1230
Light shale, hard	21	456	White sandstone, soft	4	1234
Coal, soft	4	460	Dark limestone, hard	5	1239
Dark shale, soft	21	481	Dark shale, soft	26	1265
Light shale, hard	18	499	Gray limestone, hard	17	1282
Dark shale, hard	4	503	Light shale, soft	3	1285
Gray limestone, hard	9	512	Brown limestone, hard (Golconda)	33	1318
Dark shale, soft	57	569	Dark shale, soft (Cypress) ..	7	1325
Light shale, soft	10	579	Gray limestone, hard	5	1330
Gray limestone, hard ...	4	583	Dark shale, soft	10	1340
Dark shale, soft	56	639	White sandstone, hard ...	76	1416
Gray sandstone, hard	7	646	Gray limestone, hard (Beech Creek)	4	1420
Dark shale, soft	5	651	Dark shale, soft	10	1430
Light shale, soft	20	671	Gray limestone, hard	2	1432
Dark shale, soft	33	704	Dark shale, soft	6	1438
Gray limestone, hard	5	709	Red rock, soft	2	1440
Dark shale, soft	17	726	Dark shale, soft (Elwren) ..	32	1472
Gray sandstone, hard	22	748	Gray limestone, soft (Reelsville)	3	1475
Dark shale, soft	22	770	Dark shale, soft	3	1478
Light shale, soft	12	782	Gray limestone, hard	3	1481
White sandstone, hard	28	810	Brown limestone, hard ...	9	1490
Dark shale, soft	5	815	Gray sandstone, hard (Sample)	22	1512
Gray limestone, hard	5	820	Brown sandstone, soft ...	5	1517
Dark shale, soft	8	828	Brown sandstone, soft ...	44	1521
White sandstone, soft ...	16	844	Black shale, soft	2	1523
Coal, soft	2	846	Gray sandstone, fine	5	1528
Dark shale, soft	9	855	Gray sandstone, fine	10	1538
White sandstone, soft ...	25	880			
Dark shale, soft	38	918			
Gray limestone, hard	7	925			
White sandstone, hard (Mansfield)	48	973			
Dark shale, soft	6	979			
Brown limestone, hard (Siberia)	4	983			

Water (5 bailers per hour), 65 feet. Water (1 bailer per hour), 646 feet. Water (2 bailers per hour), 810 feet. Water (hole filled up), 880 feet. Oil, first showing (Sample sand), 1512 feet. Oil, first pay, 1517 feet. Oil, best pay, 1521 feet. Production first 24 hours, 77 barrels. Production second 24 hours, 80 barrels.

Casing Record—12½-inch, 334 feet; 10-inch, 979 feet; 8¼-inch, 1216 feet; 6½-inch, 1486 feet.

Jones-Cunningham line. Well No. 1. Donation 116. Elevation 500 feet. Well completed May 6, 1918.

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Soil, soft	1	1	Gravel, soft	10	20
Yellow clay, soft	9	10	Shale, light	11	31

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Coal, soft	2	33	Light limestone, hard ...	3	1035
Shale, light	5	38	Light shale, soft	25	1060
Brown limestone, hard ..	5	43	Gray limestone, hard (Si-		
Light shale, soft	39	82	beria)	2	1062
Dark shale, soft	65	147	Light sandstone, hard	43	1105
Sandstone, hard	10	157	Sandy limestone, hard ...	10	1115
Dark shale, soft	40	197	Salt sand, soft	40	1155
Coal, soft	2	199	Dark limestone, hard	7	1162
Dark shale, soft	6	205	White sandstone, soft	71	1233
Gray limestone, hard	20	225	Dark shale, soft	10	1243
Gray sandstone, hard	50	275	Dark limestone, hard (Glen		
Dark shale, soft	10	285	Dean)	17	1260
Coal, soft	3	288	Dark shale, soft	3	1263
Dark shale, soft	10	298	Gray limestone, hard	2	1265
Gray limestone, hard	3	301	Dark shale, soft	4	1269
Coal, soft	6	307	Dark limestone, hard	3	1272
Dark shale, soft	18	325	Water sand, soft	37	1309
Light shale, soft	30	355	Gray limestone, hard	9	1318
White sandstone, hard ...	15	370	Dark shale, soft	16	1334
Dark shale, soft	25	395	Gray limestone, hard (Gol-		
Gray limestone, hard	15	410	conda)	21	1355
Light shale, soft	25	435	Dark shale, soft	50	1405
Dark shale, soft	60	495	Light sandstone, hard ...	10	1415
Light shale, soft	25	520	Dark shale, soft	25	1440
Dark shale, soft	25	545	Light sandstone, hard (Cy-		
Light shale, soft	8	553	press)	30	1470
Dark shale, soft	10	563	Dark shale, soft (Beech		
White sandstone, hard ...	16	579	Creek)	8	1478
Light shale, soft	16	595	Red rock, soft	3	1481
Gray limestone, hard	5	600	Dark shale, soft	4	1485
Light shale, soft	34	634	Gray limestone, hard	7	1492
Dark shale, soft	36	670	Dark shale, soft (Elwren).	36	1528
Light shale, soft	19	689	Brown limestone, hard		
Gray sandstone, hard	44	733	(Reelsville)	10	1538
Light shale, soft	7	740	Light sandstone, hard		
Dark shale, soft	5	745	(Sample)	3	1541
Gray sandstone, hard	27	772	Light sandstone, soft	3	1544
Dark shale, soft	13	785	Light sandstone, soft	4	1548
Coal, soft	4	789	Sandstone, darker	4	1552
Light sandstone, hard ...	18	807	Light sandstone, ...	2	1554
Dark shale, soft	21	828	Light sandstone, ...	5	1559
Light sandstone, hard	30	865	Light sandstone, ...	1	1560
Dark shale, soft	12	877	Dark shale soft	2	1562
Light sandstone, hard			Light sandstone, soft ...	4	1566
(Mansfield)	27	904	Brown sandstone, soft ...	4	1570
Light shale, soft	12	916	Gray sandstone, soft	3	1573
Dark limestone, hard	4	920	White sandstone, soft ...	2	1575
Dark shale, soft	112	1032			

Water (well filled up), 38 feet. Water (1 bailer per hour), 733 feet. Water (well filled), 805, 1115-1275 feet. Water (showing), 1573 to 1575 feet. Bad hole at 805 feet. Production first 12 hours, 12 barrels.

Casing Record—16-inch, 40 feet; 12½-inch, 294 feet; 10-inch, 904 feet; 8¼-inch, 1243 feet; 6¾-inch, 1528 feet.

Randall Cunningham Well No. 1. Donation 122. Elevation 484 feet.
Well completed October 26, 1917.

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Dark soil	1	1	Dark shale	10	630
Yellow clay	26	27	White slate	15	645
Dark shale	39	66	Limestone, white	5	650
Light sand, water	7	73	Gray shale	24	674
Dark shale	52	125	Gray sandstone	11	685
Coal	3	128	Black shale	30	715
Dark shale	14	142	Brown shale	20	735
Gray shale	14	156	Dark shale	15	750
Light sandstone	3	159	Black limestone	5	755
Dark shale	11	170	Gray mud	7	762
Coal	4	174	Gray sand	12	774
White limestone, hard ...	4	178	Dark shale	11	785
Light shale	5	183	Gray sandstone	18	803
Light limestone	4	187	Gray shale	9	812
Light shale	7	194	White shale	12	824
Light limestone	4	198	Gray sandstone	24	848
Dark shale	12	210	Dark shale	7	855
Light shale	5	215	Brown shale	10	865
Dark shale	8	223	Gray shale	15	880
Brown sandstone	6	229	Dark shale	3	883
Light limestone	3	232	Coal	2	885
Gray sandstone	13	245	Gray limestone	3	888
White limestone, hard ...	5	250	Brown shale	12	900
Brown limestone	5	255	White sandstone, water		
Light sandstone	12	267	(Mansfield)	19	919
Black shale	9	276	Gray sandstone, dark ...	106	1025
White limestone	4	280	Dark limestone, hard ...	3	1028
Coal	5	285	Gray sandstone	22	1050
White shale	13	298	White sandstone, water ..	15	1065
White limestone, hard ...	7	305	Dark shale	3	1068
White sandstone	33	338	Dark limestone, hard (Si-		
Dark shale	7	345	beria)	2	1070
Light shale	17	362	Dark shale	10	1080
Dark shale	8	370	Light limestone, hard,		
Dark limestone	3	373	sandy (Tar Springs) ...	6	1086
Coal	2	375	Dark shale	5	1091
White sandstone	10	385	Dark sandstone	5	1096
Light shale	20	405	Dark shale	8	1104
Dark shale	45	450	Gray sandstone	3	1107
Light shale	15	465	Light shale	7	1114
White shale	10	475	White sandstone	7	1121
Black shale	10	485	Light shale	5	1126
Gray slate	30	515	White sandstone, water ..	82	1208
Dark shale	15	530	Dark shale	36	1244
White mud	3	533	White limestone, hard ...	3	1247
Gray sandstone	3	536	White sandstone, (Hardins-		
Dark shale	9	545	burg)	44	1291
Gray sandstone	10	555	Dark shale	9	1300
Gray shale	20	575	Gray limestone	5	1305
White limestone, hard ...	5	580	Dark shale	5	1310
White mud	4	584	Gray limestone (Golconda)	23	1333
Gray limestone	4	588	Dark shale	52	1385
Light limestone, broken ..	7	595	Gray sandstone (Cypress).	70	1455
Gray slate	17	612	Dark shale (Beech Creek)	5	1460
Coal	3	615	Red rock	3	1463
Gray limestone	5	620	Dark shale (Elwren)	34	1497

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Gray limestone	7	1504	Dark sandstone (Moore-		
Dark shale (Reelsville) ..	3	1507	town)	14	1719
Gray limestone	9	1516	Light sandstone	9	1728
Brown limestone	11	1527	Dark shale	20	1748
Dark shale (Sample)	3	1530	Gray limestone	9	1757
Light sandstone	3	1533	Dark shale	11	1768
Light sand, oil	3	1536	Gray limestone	5	1773
Light sandstone, empty ..	14	1550	Dark shale	2	1775
Brown limestone, hard ...	3	1553	Light shale	5	1780
Light sandstone	67	1620	Dark shale	8	1788
Dark limestone (Beaver			Gray sand, oil	7	1795
Bend)	38	1658	Dark shale	2	1797
Light shale	6	1664	Light sandstone	3	1800
Dark shale	21	1685	Dark sandstone	9	1809
Red rock	3	1688	Gray sandstone	7	1816
Dark shale	7	1695	Dark limestone (Paoli) ..	21	1837
Dark limestone	10	1705	Dark limestone	34	1871

Water (8 bailers), 70 feet. Water (4 bailers per hour), 685 feet. Water (hole filled up), 905 and 1260 feet. Gas (little), 1532 feet. Oil, (top of pay sand), 1533 feet. Oil (best pay sand), 1536 feet. Oil, 1795 feet. Production first 24 hours, 20 barrels. Production second 24 hours, 50 barrels. Production third 24 hours, 75 barrels.

Casing Record—12½-inch, 367 feet; 10-inch, 929 feet; 8¼-inch, 1244 feet; 6½-inch, 1519 feet; 5⅝-inch, 1695 feet.

Randall Cunningham Well No. 2. Donation 122. Elevation 456 feet. Well completed May 22, 1918.

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Yellow clay, soft	5	5	Gray limestone, hard	10	530
Blue mud, soft	30	35	Light shale, soft	12	542
Dark shale, soft	60	95	Dark shale, soft	46	588
Light shale, soft	20	115	Coal, soft	5	593
Dark shale, soft	40	155	Dark shale, soft	15	608
Coal, soft	5	160	White shale, soft	18	626
Dark shale, soft	40	200	Gray limestone, hard	4	630
White limestone, hard ...	4	204	Dark shale, soft	20	650
White sandstone, soft ...	25	229	Light shale, soft	8	658
Coal, soft	7	236	Dark shale, soft	42	700
Dark shale, soft	34	270	Light shale, soft	35	735
White shale, soft	40	310	Brown shale, soft	15	750
Dark shale, soft	35	345	Dark shale, soft	10	760
Coal, soft	2	347	Light sandstone, soft	20	780
Dark shale, soft	3	350	Gray limestone, hard	5	785
Light shale, soft	21	371	Brown shale, soft	15	800
Dark shale, soft	20	391	White shale, soft	10	810
Gray limestone, hard	6	397	White limestone, broken ..	15	825
Dark shale, soft	20	417	Dark shale, soft	25	850
Light shale, soft	12	429	White limestone, hard ...	6	856
Gray limestone, hard	6	435	White shale, soft	9	865
Black shale, soft	10	445	Dark shale, soft	5	870
Dark shale, soft	20	465	White limestone, hard	6	876
Light shale, soft	15	485	Light sandstone, soft		
Dark shale, soft	15	500	(Mansfield)	47	923
Gray limestone, hard	12	512	Dark shale, soft	2	925
Dark shale, soft	8	520	Gray limestone, hard	5	930

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Dark shale, soft	45	975	Light sandstone, soft	5	1328
Light shale, soft	20	995	Dark shale, soft (Indian Springs)	31	1359
Dark shale, soft (Buffalo Wallow)	31	1026	Brown sandstone, soft (Cypress)	10	1369
Gray limestone, hard (Siberia)	6	1032	White sandstone, soft....	40	1409
Dark shale, soft (Tar Springs)	30	1062	Gray limestone, hard	6	1415
Gray limestone, hard	13	1075	Dark shale, soft (Beech Creek)	3	1418
Sandy limestone, hard	35	1110	Red rock, soft	3	1421
Dark sandstone, soft	60	1170	Dark shale, soft (Elwren) ..	25	1446
Dark shale, soft	12	1182	Dark shale, soft (Sample) ..	29	1475
Gray limestone, hard (Glen Dean)	3	1185	Gray limestone, hard (Beaver Bend)	3	1478
Light shale, soft	9	1194	Dark shale, soft	2	1480
Gray limestone, hard	6	1200	Brown limestone, hard	6	1486
Dark shale, soft	20	1220	Shale	2	1488
Gray limestone, hard	7	1227	Sand, gas (Mooretown)....	17½	1505½
Dark shale, soft (Hardinsburg)	20	1247	Sandstone	5½	1511
White sandstone, water... 20	1267		Sandstone, brown	5½	1516½
White sandstone, water... 16	1283		Sandstone, lighter	5½	1522
White limestone, hard (Golconda)	17	1300	Sandstone, light	5	1527
Dark shale, soft	23	1323	Sandstone, light	5	1532
			White sandstone, light ...	5	1537

Water (1 bailer per hour), 150 feet. Water (2 bailers), 230 feet.
 Water (5 bailers), 825 feet. Water (well filled), 897, 1250 and 1409 feet.
 Gas (little), 1410 feet. Gas, 1503 feet.

Casing Record—12½-inch, 359 feet; 10-inch, 926 feet; 8¼-inch, 1196 feet; 6⅝-inch, 1480 feet.

Randall Cunningham Well No. 3. Donation 122. Elevation 450.43 feet. Well completed August 7, 1918.

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Dark soil, soft	1	1	Dark shale, soft	15	320
Yellow clay, soft	10	11	Light shale, soft	15	335
Sandy clay, soft	27	38	Light limestone, soft	8	346
Dark shale, soft	32	70	White limestone, hard	12	358
Light shale, soft	5	75	White shale, soft	16	374
Light sandstone, soft	4	79	Dark shale, soft	21	395
Coal, soft	4	83	Light shale, soft	15	410
Light shale, soft	27	110	Light limestone, hard	10	420
Dark shale, soft	20	130	Light sandstone, soft	20	440
Light shale, soft	12	142	Black shale, soft	25	465
Light limestone, hard	4	146	Light shale, soft	13	478
Light shale, soft	2	148	Dark shale, soft	22	500
Coal, soft	6	154	Light sandstone, soft	8	508
Dark shale, soft	14	168	Dark shale, soft	10	518
Light shale, soft	22	190	Grey limestone, soft	5	524
Light sandstone, soft	25	215	Grey shale, soft	16	540
White limestone, hard....	15	230	Grey limestone, hard	18	558
Dark shale, soft	20	250	Light shale, soft	17	575
Light shale, soft	10	260	Grey limestone, hard	13	588
White limestone, hard, sandy	5	265	Light shale, soft	32	620
White sandstone, soft	40	305	Dark shale, soft	18	638
			Light shale, soft	22	660

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Dark shale, soft	10	670	Dark shale, soft	10	1181
White limestone, hard	4	674	White shale, soft	23	1204
Light shale, soft	26	700	White limestone, hard	5	1209
Dark shale, soft	10	710	Dark shale, soft	25	1234
Light shale, soft	25	735	White sandstone, soft	6	1240
Light shale, soft	5	740	Light shale, soft	10	1250
Brown sandstone, hard ...	20	760	White limestone, hard	4	1254
White shale, soft	15	775	Dark shale, soft	20	1274
White limestone, medium..	10	785	White shale, soft	10	1284
White sandstone, soft	30	815	White limestone, hard	16	1300
Dark shale, soft	25	840	White shale, soft	22	1322
Light shale, soft	12	852	White sandstone, soft	13	1335
Light limestone, gritty ...	10	862	White limestone, hard	5	1340
Dark shale, soft	20	882	White sandstone, soft	10	1350
White sandstone, soft	15	897	Dark shale, soft	5	1355
Dark shale, soft	7	904	White sandstone, soft (Cy- press)	55	1410
Grey limestone, hard	5	909	Light limestone, hard (Beech Creek)	5	1415
Light shale, soft	16	925	Red rock, soft	2	1417
Dark shale, soft	10	935	Black shale, soft.....	5	1422
Light shale, soft	15	950	Grey limestone, hard	18	1440
Dark shale, soft	20	970	Black shale, soft (Elwren)	40	1480
White sandstone, soft	10	980	Grey limestone, hard (Reels- ville)	3	1483
Red rock, soft	5	985	Brown limestone, hard (Sample)	5	1488
White sandstone, soft	5	990	Dark shale, soft	2	1490
White limestone, hard	5	995	Grey sandstone, coarse ...	7	1497
White sandstone, soft	28	1023	Grey sandstone, coarse ...	5	1502
Dark shale, soft	7	1030	Sand, lighter, finer	3	1505
Light limestone, hard	6	1036	Sand, darker, softer	8	1513
Dark shale, soft	6	1042	Light sandstone, soft	8	1521
White limestone, hard	20	1062	Grey sandstone, coarser ...	5	1526
Grey limestone, hard-gritty	20	1082	Sandstone, lighter and finer	6	1532
Dark shale, soft	6	1088			
White limestone, hard	3	1091			
White sandstone, soft	40	1131			
White limestone, hard	14	1145			
White sandstone, soft	26	1171			

Water (1 bailer per hour), 154 feet. Water (2 bailers per hour), 300 feet. Show of gas at 1295 feet. First oil showing, 1497 feet. Best pay sand, 1503 and 1513 feet. Production first 24 hours, 70 barrels. Production second 24 hours, 60 barrels. Production third 24 hours, 40 barrels.

Casing Record—16-inch, 40 feet; 12½-inch, 358 feet; 10-inch, 913 feet; 8¼-inch, 1204 feet; 6½-inch, 1483 feet.

Lester Cunningham Well No. 1. Donation 117. Elevation 481.72 feet. Well completed April 23, 1917.

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Yellow clay, soft	18	18	Light limestone, hard	4	104
Yellow limestone, medium hard	4	22	Light shale, soft	16	120
Blue clay, soft	21	43	White sandstone, soft	10	130
Coal, soft	2	45	White limestone, hard	8	138
Shale, dark	10	55	White sandstone, hard	20	158
Light limestone, medium hard	7	62	Light shale, soft	16	174
Blue mud, soft	38	100	Coal, soft	2	176
			Light shale, muddy	6	182
			White limestone, hard	18	200

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Light shale, soft	12	212	Dark shale, soft	45	885
Dark shale, soft	13	225	White sandstone, soft		
Light limestone, hard	8	233	(Mansfield)	20	905
Dark shale, soft	2	235	White limestone, hard	5	910
Gray limestone, hard	13	248	Dark shale, soft	25	935
Dark shale, medium hard..	12	260	White limestone, hard	30	965
Light sandstone, dry	15	275	White sandstone, medium		
Gray limestone, hard	8	283	soft	87	1052
White shale, soft	7	290	White shale, soft	3	1055
Coal V, soft	4	294	White limestone, hard (Si-		
Dark shale, soft	9	303	beria)	2	1057
Gray sandstone, dry	27	330	White shale, soft	3	1060
Brown mud, soft	19	349	Gray limestone, hard	15	1075
Blue mud, soft	6	355	Gray sandstone, dry	20	1095
Black limestone, hard	3	358	White shale, soft	8	1103
Dark shale, soft	8	366	White limestone, hard	47	1150
White shale, sandy	34	400	White sandstone, water ...	55	1205
White mud, soft	15	415	White shale, soft	10	1215
Dark limestone, hard	12	427	Gray limestone, hard	2	1217
Brown shale, medium hard	21	448	White shale, soft	21	1238
Dark shale, soft	17	465	Red rock, soft	2	1240
Light shale, soft	21	486	Dark shale, soft	12	1252
White limestone, hard	1	487	Gray sandstone, hard	5	1257
Coal IVa, soft	3	490	Dark shale, soft	5	1262
Light shale, soft	12	502	White sandstone, soft	31	1293
White limestone, hard	5	507	White shale, soft	4	1297
Black shale, soft	5	512	White limestone, hard	18	1315
Gray limestone, hard	15	527	White sandstone, hard	5	1320
White shale, medium hard	5	532	White limestone, hard (Gol-		
White limestone, hard	5	537	conda)	25	1345
Brown shale, medium hard	23	560	White shale, medium hard	15	1360
Dark shale, soft	3	563	White sandstone, medium		
Coal, soft	2	565	hard	15	1375
Dark shale, soft	5	570	White shale, soft	10	1385
Light shale, soft	20	590	White sandstone, water (Cy-		
Coal, soft	12	602	press)	63	1448
Brown mud, soft	4	606	White limestone, hard		
Dark shale, medium hard..	24	630	(Beech Creek)	8	1456
White shale, soft	22	652	Blue shale, soft	8	1464
Gray limestone, hard	4	656	Gray limestone, hard	11	1475
Gray sandstone, water	24	680	Red rock, soft (Elwren)..	2	1477
Coal, soft	3	683	Dark shale, soft	28	1505
Dark shale, soft	22	705	Brown limestone, hard		
Black limestone, hard	5	710	(Reelsville)	6	1511
Black shale, medium hard.	15	725	Dark shale, soft (Sample)..	5	1517
Dark limestone, hard	12	742	Gray limestone, shell	1	1518
Dark shale, soft	5	747	Brown limestone, hard	7	1525
White shale, soft	13	760	Blue shale, soft	7	1532
White sandstone, medium			Light sandstone, oil	15	1548
hard	5	815	White sandstone, empty,		
White shale, medium hard	15	830	some water	4	1551
White limestone, hard	10	840			

Water (20 bailers per hour), 55 feet. Water (1 bailer per hour), 602 feet. Water (4 bailers per hour), 670 feet. Water (12 bailers per hour), 683 feet. Water (hole filled up, 905 and 1155 feet. Water (filled 150 feet in one hour), 1390 feet. Water (filled with black water), 1400 feet.

Gas (light), 1392 feet. Oil sand, top, 1532 feet. Oil sand, bottom, 1548 feet. Production first 14 hours, 77½ barrels. Production second 14 hours, 77½ barrels. Production third 16 hours, 85 barrels. Production fourth 7 hours, 25 barrels.

Casing Record—12½-inch, 365 feet; 10-inch, 1065 feet; 8¼-inch, 1320 feet; 6⅝-inch, 1515 feet.

Lester Cunningham Well No. 2. Donation 117. Elevation 443.83 feet. Well completed June 8, 1917.

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Yellow clay, soft	25	25	Shale	35	970
White sand, soft	15	40	Sandstone	25	995
Light shale, soft	105	145	Shale	17	1012
Coal, soft	2	147	Limestone (Siberia)	6	1018
Dark shale, soft	48	195	Shale (Tar Springs)	32	1050
White sandstone, soft	50	245	Sandstone	45	1095
Light shale	45	290	White sandstone, water... ..	65	1160
White limestone, hard	15	305	Black mud (Glen Dean)... ..	16	1176
White shale	30	335	Limestone	14	1182
Coal	3	338	Shale (Hardinsburg)	88	1270
White limestone, hard	12	350	Limestone (Golconda)	20	1290
Shale	22	372	Sandstone (Cypress)	50	1340
Limestone	8	380	Sandstone	90	1430
Shale	80	460	Limestone (Beech Creek)... ..	1	1431
Limestone	15	475	Dark shale	11	1440
Shale	75	550	Limestone	1	1441
Limestone	10	560	Dark shale (Elwren)	19	1460
Shale	130	690	Light shale	10	1470
Sandstone	20	710	Gray limestone, sandy (Reelsville)	4	1474
Shale	5	715	Gray limestone	2	1476
Limestone	5	720	Brown limestone, broken.. ..	9	1485
Shale	35	755	Shale (Sample)	6	1491
Mud	15	770	Light sandstone, oil	13	1504
Shale	55	825	Shale	10	1514
Limestone	25	850	Light sandstone, coarse	16	1530
Shale	60	910			
Sandstone, water	25	935			

Gas, light showing, 1342 feet. Oil, light showing, 1345 feet. Oil, 1470 to 1472 feet. Oil, good showing, 1491 to 1504 feet. Production fire 10 hours, 40 barrels. Production second 12 hours, 22½ barrels. Production third 18 hours, 65 barrels.

Casing Record—16-inch, 58 feet; 12½-inch, 374 feet; 10-inch, 1022 feet; 8¼-inch, 1188 feet; 6⅝-inch, 1479 feet.

Lester Cunningham Well No. 3. Donation 117. Elevation 458 feet. Well commenced July 15, 1918.

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Soil, soft	1	1	Dark limestone, hard	2	88
Yellow clay, soft	11	12	Light shale, soft	30	118
White mud, soft	11	23	Light sandstone, soft	27	145
Dark shale, soft	17	40	Dark shale, soft	10	155
Black shale, soft	10	50	Dark sandstone, hard	11	166
Light shale, soft	10	60	Coal VI, soft	4	170
Light sand, soft	7	67	Light shale, soft	20	190
Light shale, soft	19	86	Dark sandstone, hard	10	200

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Dark shale, soft	66	266	Light sandstone, soft (Tar		
Brown limestone, hard ...	6	272	Springs)	48	998
Dark shale, soft	2	274	Dark shale, soft	4	1002
Coal V, soft	5	279	Light sandstone, soft	10	1012
Light shale, hard	17	296	Lime—sandy, hard	16	1028
Light sandstone, hard	29	325	Dark shale, soft	5	1033
Brown shale, soft	30	355	Light sandstone, hard	32	1065
Dark shale, soft	5	360	Black shale, soft	4	1069
Brown limestone, hard	2	362	Dark sandstone, hard	4	1073
Light shale, soft	10	372	Light shale, soft	27	1100
Light limestone, hard	5	377	Dark sandstone, soft	8	1108
Light shale, soft	23	400	Dark shale, soft	3	1111
Dark shale, soft	13	413	Dark sandstone, hard	7	1118
Dark sandstone, hard	3	416	Light shale, soft	12	1130
Dark shale, soft	8	424	Light sandstone, hard	15	1145
Dark sandstone, hard	7	431	Light shale, soft	2	1147
Black shale, soft	9	440	Dark limestone, hard (Glen		
Dark shale, soft	15	455	Dean)	8	1155
Black shale, soft	15	470	Light sandstone, soft (Har-		
Dark shale, soft	37	507	dinsburg)	67	1222
Coal, soft	4	511	Light shale, soft	15	1237
Dark shale, soft	5	516	Dark limestone, hard	3	1240
Gray limestone, hard	4	520	Dark shale, soft	18	1258
Light shale, soft	10	530	Light sandstone, soft	35	1293
Dark shale, soft	28	558	Dark shale, soft	16	1309
Gray limestone, hard	2	560	Brown limestone, hard	26	1337
Light shale, soft	15	575	Brown sandstone, hard ...	3	1340
Gray sandstone, hard	10	585	Gray limestone, hard (Gol-		
Light shale, soft	12	597	conda)	14	1354
Black shale, soft	8	605	Light shale, soft	3	1357
Dark shale, soft	15	620	Light sandstone, soft	7	1364
Light shale, soft	23	643	Dark limestone, hard	2	1366
Dark shale, soft	15	658	Dark shale, soft (Indian		
Dark sandstone, hard	17	675	Springs)	22	1388
Light sandstone, water ...	12	687	Light sandstone, soft (Cy-		
Dark shale, soft	55	742	press)	66	1454
Dark sandstone, hard	8	750	Light limestone, hard		
Dark shale, soft	5	755	(Beech Creek)	9	1463
Light sandstone, soft	35	790	Dark shale, soft	9	1472
Dark shale, soft	13	803	Red rock, soft	2	1474
Light sandstone, soft	40	843	Dark shale, soft (Elwren)	31	1505
Light shale, soft	7	850	Light limestone, hard		
Light sandstone, hard	5	855	(Reelsville)	2	1508
Light shale, soft	6	861	Dark shale, soft	5	1513
Light sandstone, soft	4	865	Gray limestone, hard	2	1515
Dark shale, soft	25	890	Brown limestone, hard ...	8	1523
Light sandstone, soft	20	910	Dark shale, soft (Sample).	7	1530
Dark shale, soft	17	927	Sand and shale, soft	5	1535
Dark limestone, hard (Si-			Dark sandstone, broken ...	9	1544
beria)	2	929	Lighter sandstone, finer ..	10	1554
Dark shale, soft	21	950	Lighter sandstone	13½	1567½

Oil showing, 1377 feet. "Blue Lick" water, 1395 feet. Well plugged.
 Casing Record—16-inch, 49 feet; 12½-inch, 361 feet; 10-inch, 927
 feet; 8¼-inch, 1237 feet; 6½-inch, 1505 feet.

Sam Ford Well No. 1. Donation 121. Elevation 461 feet. Well completed November 24, 1916.

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Yellow clay	23	23	Limestone	2	824
Dark sand	16	39	Dark shale	11	835
Light limestone, medium hard	2	41	Limestone	11	846
Blue mud	24	65	Dark shale	28	874
Dark shale	43	108	Sandstone	11	885
Light sandstone, hard	26	134	Dark shale	33	918
Shale	1	135	White mud	20	938
Limestone	5	140	Limestone	4	942
Blue mud	13	153	White shale	8	950
Coal	2	155	White limestone	10	960
Blue mud	15	170	Gray sandstone	58	1018
Dark shale	40	220	Dark shale	3	1021
Blue mud	13	233	White limestone	2	1023
Light sandstone	10	243	Black shale	10	1033
Shale	20	263	Light shale	15	1048
Limestone, hard	3	266	Sandstone	18	1066
Coal	5	271	Light shale	10	1076
Black shale	14	285	Gray limestone	17	1093
Sandstone, water	15	300	Dark shale	12	1105
Shale	10	310	Limestone (Siberia).....	12	1117
Brown mud	20	330	Dark shale	3	1120
Blue slate	15	345	Limestone	5	1125
White limestone	5	350	White sandstone, water (Tar Springs)	59	1184
White shale	12	362	Light shale	2	1186
White limestone	10	372	Gray limestone	4	1190
Light shale	23	395	Dark shale	12	1202
Dark shale	35	430	Limestone	4	1206
Black shale	15	445	Dark shale	10	1216
Light shale	25	470	Red rock	2	1218
Dark shale	20	490	Blue mud, sticky	4	1222
White limestone	15	505	Dark limestone	3	1225
Dark shale	7	512	Blue mud, sticky	3	1228
Light shale	16	528	White sandstone	6	1234
Dark shale	5	533	Gray limestone (Glen Dean)	4	1238
White limestone	1	534	Gray sandstone	14	1252
Coal	2	536	Shale	3	1255
Dark shale	4	540	White sandstone	11	1266
White shale	32	572	Shale	10	1276
Dark shale	8	580	Sandstone	46	1322
Light shale	13	593	Shale	30	1352
Dark shale	5	598	Sandstone	4	1356
Light shale	10	608	Light limestone, hard, sharp (Golconda)	20	1376
Dark shale	17	625	Dark shale	3	1379
White lime	27	652	White sandstone, water (Cypress)	51	1430
White sandstone, water ...	15	667	Dark limestone (Beech Creek)	5	1435
Dark shale	18	685	Red rock	20	1455
Light shale	35	720	Dark shale (Elwren).....	41	1496
Limestone, hard	2	722	Brown limestone, hard (Reelsville)	8	1504
Dark shale	8	730	Dark shale (Sample).....	8	1512
Light shale	5	735	Brown sand, oil.....	13	1525
Sandstone	15	750			
Dark shale	45	795			
Sandstone	10	805			
Dark shale	17	822			

Water (2 bailers in 12 hours), 70 feet. Water (8 bailers per hour), 300 feet. Water (11 bailers per hour), 667 feet. Water (hole filled up), 1385 feet. Oil sand, top, 1512 feet. Oil, first showing, 1517 feet. Oil, best, 1520 and 1523 feet. Production first 8 hours, 60 barrels water. Production second 24 hours, 115 barrels oil, 42 barrels water. Production third 12 hours, 20 barrels oil, 50 barrels water. Production fourth 12 hours, 37 barrels oil, 37 barrels water.

Casing Record—16-inch, 39 feet 11 inches; 10-inch, 1030 feet; 8½-inch, 1245 feet; 6¾-inch, 1506 feet.

Sam Ford Well No. 2. Donation 118. Elevation 443 feet. Well completed September 2, 1917.

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Dark soil, soft	10	10	Gray limestone, hard	5	785
Yellow clay, soft	8	18	Brown shale, hard	10	795
White sandstone, soft	15	33	White limestone, hard	25	820
White gravel, loose	3	36	White shale, soft	45	865
White sand, loose	4	40	White sandstone, soft	15	880
White shale, soft	30	70	Black shale, soft	35	915
White sand, water	70	140	White limestone, hard (Mansfield)	25	940
Light shale, soft	5	145	White sandstone, medium hard	61	1001
Coal, soft	2	147	White shale, soft	4	1005
White shale, soft	68	215	Dark sandstone, soft	16	1021
White limestone, hard	10	225	White limestone, hard (Si- beria)	2	1023
Brown shale, hard	5	230	Light shale, soft	12	1035
Gray limestone, hard	10	240	White sandstone, soft	30	1065
Coal, soft	4	244	White limestone, hard (Glen Dean)	20	1085
White shale, soft	16	260	White shale, medium hard	5	1090
White sandstone, medium..	25	285	White sandstone, medium hard	10	1100
Brown mud, soft	20	305	White shale, soft	10	1110
White limestone, hard	5	310	Light sandstone, water	58	1168
White shale, hard	5	315	Light shale, soft	4	1172
White limestone, hard	5	320	White limestone, hard	2	1174
White shale, soft	5	325	White shale, soft	40	1214
White limestone, hard	10	335	Red rock, soft	2	1216
White shale, soft	65	400	White limestone, hard	11	1227
Brown shale, medium	25	425	Dark shale, soft	3	1230
White shale, soft	55	480	White limestone, hard	5	1235
Gray limestone, hard .. .	5	485	White sandstone, hard	10	1245
White shale, soft	10	495	White shale, soft	10	1255
White limestone, hard	10	505	Dark limestone, hard (Gol- conda)	27	1282
White mud, soft	10	515	Light sandstone, medium hard	12	1294
White limestone, hard	5	520	Dark shale, medium soft (Indian Springs)	25	1319
Light shale, soft	15	535	Light sandstone, medium soft	1	1320
Light sandstone, soft	25	560	White sandstone, gas (Cy- press)	93	1413
White shale, soft	60	620	White limestone, hard (Beech Creek)	2	1415
Gray limestone, hard	15	635			
Gray sandstone, soft	15	650			
Black shale, soft	25	675			
White shale, soft	20	695			
White sandstone, medium hard	10	705			
Gray limestone, hard	10	715			
Black shale, soft	10	725			
White limestone, hard	10	735			
White sandstone, hard	5	740			
White shale, soft	40	780			

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Dark shale	2	1417	Brown limestone, hard		
White limestone, hard	5	1422	(Beaver Bend)	9	1488
Red rock, soft	2	1424	Dark shale (Mooretown)..	10	1498
Dark shale	9	1433	Gray shale	4	1502
White limestone, hard			White mud	4	1506
(Reelsville)	6	1439	Gray shale	3	1509
Soapstone, soft (Sample)..	5	1444	White sandstone	8	1517
White mud	4	1448	Dark shale	3	1520
Gray shale	7	1455	Light sandstone, broken ..	15	1535
Dark shale	7	1479	White sandstone, settling..	6	1541

Water (6 bailers), 75 feet. Water (2 bailers per hour), 650 feet. Water (hole filled up), 870, 1050 and 1370 feet. Water (6 bailers per hour), 1541 feet. Gas, light, 1235 feet. Gas, 1282 to 1294 feet. Gas, best, 1320 feet. Oil, showing, 1294 feet. Oil, 1514 feet. Well plugged.

Casing Record—12½-inch, 338 feet; 10-inch, 1030 feet; 8¼-inch, 1227 feet; 6⅝-inch, 1342 feet; 5⅛-inch, 1483 feet.

Minnie Jones Well No. 1. Donation 116. Elevation 478.64 feet. Well completed August 30, 1917.

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Yellow mud	12	12	Dark shale	80	1030
Light limestone	1	13	Dark shale, gritty	20	1050
White mud	22	35	White sandstone, gritty ...	10	1060
Dark shale	35	70	White limestone, hard ...	10	1070
Light shale	30	100	Brown limestone (Siberia)..	10	1080
Light sandstone	10	110	Sand, water (Tar Springs)	65	1145
Light shale	10	120	Sand, water	55	1200
Dark shale	30	150	Black shale, soft	5	1205
Light shale	75	225	Brown limestone, hard		
Sandstone	50	275	(Glen Dean)	10	1215
Dark shale	7	282	Black shale, soft	10	1225
Light shale	18	300	Gray limestone, hard	20	1245
Sandstone	60	360	Black shale, soft (Hardins-		
Dark shale	81	441	burg)	30	1275
Light shale	30	471	Gray limestone, hard	10	1285
Black shale	30	501	Dark shale, sandy	15	1300
Light shale	40	541	Yellow limestone, hard		
Black shale	20	561	(Golconda)	55	1355
Dark shale	19	580	Dark shale, sandy	20	1375
White limestone, hard	3	583	White sandstone, soft (Cy-		
Light shale	45	628	press)	75	1450
Light shale, sandy	30	658	Yellow limestone, hard		
Light limestone	12	670	(Beech Creek)	10	1460
Black shale	10	680	White limestone, hard	10	1470
White limestone, hard	15	695	Red rock (Elwren)	2	1472
Dark shale	40	735	Light shale, soft	10	1482
Light shale	30	765	Light limestone, hard		
Sand, water (Mansfield)...	20	785	(Reelsville)	4	1486
Light shale	15	800	Shale (Sample)	33	1519
White limestone, hard	15	815	Brown limestone, hard		
Light shale	40	855	(Beaver Bend)	6	1525
Light limestone, hard	10	865	Sandstone, broken (Moore-		
Light shale	30	895	town)	12	1537
Dark shale	35	930	Brown sandstone, pay	10	1547
Light shale	20	950	Sandstone, white	3	1550

Water (3 bailers per hour), 785 feet. Water (hole filled up), 1420 feet. Oil, top of pay sand, 1537 feet. Production first 24 hours, 120 barrels. Production second 24 hours, 90 barrels. Production third 24 hours, 60 barrels.

Casing Record—12½-inch, 360 feet; 10-inch, 978 feet; 8¼-inch, 1275 feet, 6⅝-inch, 1519 feet.

Minnie Jones Well No. 2. Donation 116. Elevation 456 feet. Well completed May, 1918.

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Soil	80	80	Brown shale	10	740
Dark shale	20	100	Shale	12	752
White limestone	10	110	Grey limestone, sandy	10	762
Dark shale	30	140	White sandstone (Mans- field)	18	780
White limestone	10	150	Dark shale	20	800
White shale	10	160	White shale	50	850
Coal	5	165	Blue limestone	8	858
Dark shale	40	205	Dark shale	2	860
White shale	15	220	Grey limestone	10	870
White limestone	10	230	Brown shale	48	918
White sandstone	15	245	Brown shale	60	978
Dark limestone	5	250	Grey limestone, broken (Si- beria)	6	984
White shale	10	260	Dark shale (Tar Springs) .	36	1020
Dark shale	20	280	White sandstone	160	1180
Shale	10	290	Brown shale	75	1255
White limestone	8	298	Grey limestone (Glen Dean)	25	1280
White shale	29	327	Brown shale	15	1295
White sandstone	20	347	Grey limestone (Golconda)	45	1340
White shale	36	383	Brown shale (Cypress)....	80	1420
Brown shale	87	470	Grey limestone (Beech Creek)	10	1430
Brown limestone	5	475	Blue shale (Elwren)	30	1460
Brown shale	15	490	Red rock, caving	3	1463
White limestone	10	500	Blue shale	7	1470
White shale	9	509	Blue limestone (Reelsville)	10	1480
Grey limestone	6	515	Blue shale (Sample).....	14	1494
White shale	20	535	Brown limestone, hard (Beaver Bend)	13	1507
White limestone	6	541	Shale (Mooretown)	2	1509
Dark shale	34	575	Sandstone, oil	5	1514
Grey limestone	5	580	Grey sandstone	5	1519
White shale	17	597	Sandstone, darker	2	1521
Grey limestone	8	605	Blue sandstone	3	1523
Dark shale	20	625	Shale	8	1531
White shale	18	643	Sandstone	11	1542
Grey limestone	7	650	White sandstone, hard	2	1544
White shale	18	668			
White limestone	20	688			
Brown shale	12	700			
White shale	15	715			
Brown shale	10	725			
Grey limestone	5	730			

Water (2 bailers per hour), 230 feet. Water (hole filled up), 347 feet. Water at 668, 762, 780 and 1430 feet. Well plugged.

Casing Record—12½-inch, 383 feet; 10-inch, 918 feet; 8¼-inch, 1202 feet; 6⅝-inch, 1494 feet.

Wm. Hyneman Well No. 2. Mil. donation 121. Elevation 464.5 feet.

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Soil, light soft	1/2	1/2	Limestone, light hard	2	862
Clay, yellow soft	18	18 1/2	Coal, soft	2	864
Quicksand, light soft	3 1/2	22	Shale, light soft	22	886
Shale, light soft	38	60	Sandstone, light soft	10	896
Shelly shale, dark hard ...	35	95	Shale, light soft	14	910
Sandstone, light hard	28	123	Limestone, light hard	2	912
Shale, light soft	27	150	Shale, dark soft	20	932
Coal, dark soft	5	155	Sandstone, light hard		
Shale, light soft	42	197	(Mansfield)	61	993
Sandstone, dark soft	7	204	Shale, light soft	6	999
Shale, dark soft	5	209	Sandstone, light hard	12	1011
Sandstone, light soft	16	225	Sandstone, dark hard	6	1017
Sandstone, light hard	13	238	Limestone, light hard	10	1027
Shale, dark soft	12	250	Sandstone, light hard	40	1067
Limestone, dark hard	2	252	Shale, light soft	4	1071
Shale, dark soft	5	257	Limestone, dark hard (Si-		
Coal, soft	5	262	beria)	2	1073
Shale, dark soft	4	266	Shale, dark soft (Tar		
Sandstone, light soft	50	316	Springs)	1	1074
Shale, light soft	23	339	Sandstone, dark hard	11	1085
Coal, soft	2	341	Shale, light soft	1	1086
Shale, light soft	6	347	Sandstone, light hard	4	1090
Sandstone, light soft	7	354	Shale, dark soft	2	1092
Shale, light soft	22	376	Sandstone, light hard	2	1094
Shale, dark soft	24	400	Shale, dark soft	3	1097
Shale, light soft	25	425	Limestone, hard dark	1	1098
Shale, dark soft	22	447	Shale, dark soft	1	1100
Limestone, dark hard	2	449	Sandstone, dark hard	46	1146
Shale, dark soft	18	467	Sandstone, light soft	61	1207
Sandstone, dark soft	9	476	Shale, dark soft	4	1211
Shale, dark soft	12	488	Limestone, light hard (Glen		
Limestone, dark hard	6	494	Dean)	4	1215
Coal, soft	6	500	Shale, dark soft	5	1220
Shale, dark soft	5	505	Gritty limestone, dark hard	2	1222
Limestone, light hard	3	508	Shale, dark soft (Hardins-		
Shale, light soft	28	536	burg)	11	1233
Limestone, dark hard	2	528	Shale, light soft	6	1239
Shale, dark soft	2	540	Shale, light soft	3	1242
Limestone, dark hard	2	542	Limestone, light hard	5	1247
Shale, dark hard	13	555	Shale, light soft	3	1250
Sandstone, light soft	5	560	Sandstone, dark hard	6	1256
Shale, light soft	24	584	Sandstone, light hard	12	1268
Coal, soft	5	589	Limestone, light hard	13	1281
Shale, dark soft	51	640	Shale, light soft	11	1292
Shale, dark shelly	8	648	Limestone, light hard (Gol-		
Sandstone, light hard	30	678	conda)	40	1332
Shale, dark soft	46	724	Shelly shale, dark soft ...	5	1337
Shelly shale, dark hard ...	19	743	Shale, light soft	13	1350
Limestone, light hard	2	745	Sandstone, light soft (Cy-		
Shale, dark soft	10	755	press)	83	1433
Sandstone, light medium..	12	767	Shale, dark soft (Beech		
Shale, light soft	10	777	Creek)	2	1435
Shale, light soft	24	801	Limestone, light hard	2	1437
Shale, dark soft	16	817	Shale, dark soft	19	1456
Sandstone, light soft	19	836	Red rock	2	1458
Sandstone, light soft	19	855	Shale, dark soft (Elwren).	5	1463
Shale, light soft	5	860	Limestone, light hard	2	1465

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Shale, dark soft	2	1467	(Beaver Bend)	5	1508
Red rock	2	1469	Shale, dark soft (Moore-		
Shale, dark soft (Sample) ..	18	1487	town)	10	1518
Limestone, light hard	1	1488	Sandstone, grey soft	4	1522
Limestone, light soft	1	1489	Sandstone, grey hard	3	1525
Limestone, light hard	2	1491	Sandstone, grey soft	9	1534
Shale, dark soft	8	1499	Shale, dark soft	2	1536
Limestone, grey hard	4	1503	Sandstone, light hard	1	1537
Limestone, brown hard					

Water (enough to drill), 262 feet. Water (2 bailers per hour), 589 feet. Water (6 bailers per hour), 670 feet. Water (hole filled up), 895 and 987 feet. Water (5 bailers per hour), 972 feet. Water (2 bailers per hour), 1260 feet. Water (filled with "Blue Lick"), 1378 feet. Oil fair showing, 1309 feet. Oil, first showing, 1525 feet. Oil, best pay, 1525 to 1534 feet.

C. A. Shawhan Well No. 1. Donation 121. Elevation 450 feet. Well completed October 15, 1917.

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Soil	3	3	Gray limestone, hard	5	695
Yellow clay	22	25	Dark shale	15	710
Quicksand	14	39	Light shale	15	725
Blue mud	36	75	Gray limestone	20	745
White sand	15	90	Dark shale	25	770
Shale, sandy	15	105	White limestone	10	780
Dark shale	10	115	Coal	5	785
Gray shale, sandy	10	125	Dark shale	30	815
Blue shale	25	150	White sandstone	30	845
Dark shale	48	198	Dark shale	25	870
White limestone	7	205	White sandstone (Mans-		
Dark shale	45	250	field)	10	890
Black shale	10	260	Dark shale	40	920
Blue shale	10	270	White limestone	30	950
Light sandstone	30	300	Dark shale	5	955
Brown mud	20	320	White sandstone	8	963
Black shale	5	325	Dark shale	7	970
White mud	8	333	White limestone (Siberia) ..	12	982
White limestone	17	350	Dark shale (Tar Springs) ..	8	990
White shale	20	370	Gray sandstone	10	1000
Dark shale	60	430	Dark shale	5	1005
Coal	7	437	Gray sandstone	4	1009
Dark shale	8	445	Black shale	6	1015
Light shale	15	460	Gray shale	12	1027
Dark shale	35	495	Gray limestone	3	1030
Light shale	5	500	Dark shale	20	1050
Dark shale	15	515	Light shale	10	1060
Light shale	10	525	Gray limestone	6	1066
Dark shale	10	535	Gray shale	4	1070
Light shale	37	572	White sandstone	11	1081
Coal	3	575	Gray shale	11	1090
Light shale	15	590	White limestone	25	1115
Dark shale	15	605	Dark shale (Glen Dean) ...	5	1120
Light shale	35	640	Gray limestone	15	1135
White mud	25	665	Sandstone, broken	10	1145
Dark shale	25	690			

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
White sand, water (Hard- insburg)	55	1200	Dark shale	8	1435
Light shale	10	1210	Red rock	2	1437
Dark shale	5	1215	Dark shale (Elwren)	7	1444
Light shale	20	1235	Gray limestone (Reelsville) ..	3	1447
Light shale	3	1238	Dark shale (Sample)	18	1465
Red rock	1	1239	Shale, shelly	3	1468
Light shale	2	1241	Gray limestone	4	1472
Light sandstone	14	1255	Dark shale	13	1485
Limestone, gritty	8	1263	Brown limestone (Beaver Bend)	8	1493
Black shale	12	1275	Dark shale	8	1511
Gray limestone (Golconda) ..	50	1325	Gray sandstone, oil (Moore- town)	16½	1527½
Gray sandstone (Cypress) ..	35	1360	Gray sandstone	4	1531½
White sandstone	60	1420			
Gray limestone (Beech Creek)	7	1427			

Water (10 bailers per hour), 90 feet. Water (5 bailers per hour), 575 feet. Water (10 bailers per hour), 780 feet. Water (hole filled up), 875 and 1150 feet. Oil pay sand from 1511 to 1527½ feet. Production first 24 hours, 20 barrels. Production second 24 hours, 8 barrels. Production third 24 hours, 5 barrels. Production fourth 24 hours, 15 barrels.

Casing Record—16-inch, 56 feet; 12½-inch, 343 feet; 10-inch, 1027 feet; 8¼-inch, 1260 feet; 6⅝-inch, 1469 feet.

Chas. Shawhan Well No. 2. Washington Township. Elevation 457 feet. Well completed November 24, 1917.

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Limestone, gray (Reelsville) ..	5	1459	Limestone, brown (Beaver Bend)	5	1500
Shale (Sample)	16	1475	Shale (Mooretown)	15	1515
Limestone, gray	5	1480	Sandstone, oil	16	1531
Shale	5	1485			
Shale, black	10	1495			

Casing Record—16-inch pipe, 18 feet; 12½-inch pipe, 290 feet; 10-inch pipe, 848 feet; 8¼-inch pipe, 1245 feet; 6⅝-inch pipe, 1454 feet.

Chas. Shawhan Well No. 3. Washington Township. Section 7. Elevation 494.59 feet. Well completed July 13, 1920.

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Soil, dark soft	1	1	Limestone, light hard	5	380
Clay, yellow soft	15	16	Shale, dark soft	5	385
Quicksand, yellow soft ...	25	41	Sandstone, light hard	8	393
Shale, dark soft	10	51	Shale, light soft	5	398
Sandstone, light hard	8	59	Sandstone, light medium ..	18	416
Shale, dark soft	44	103	Shale, light soft	60	476
Sandstone, grey hard	27	130	Coal, soft	5	481
Limestone, light soft	10	140	Shale, light soft	20	501
Shale, dark soft	50	190	Limestone, light medium..	10	511
Limestone, light hard	12	202	Shale, dark soft	50	561
Shale, dark soft	5	207	Sandstone, light broken ...	10	571
Limestone, light hard	17	224	Shale, dark soft	25	596
Shale, dark soft	79	303	Limestone, light hard	5	601
Limestone, light hard	3	306	Shale, dark soft	23	624
Limestone, light medium ..	6	312	Sandstone, light soft	10	634
Shale, dark soft	63	375	Shale, dark soft	5	639

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Limestone, light hard	5	644	Sandstone, light hard (Tar Springs)	5	1156
Shale, dark soft	5	649	Shale, dark soft	12	1168
Limestone, light hard	10	659	Sandstone, light hard	4	1171
Shale, dark soft	102	761	Shale, dark soft	20	1191
Sandstone, light hard	50	811	Sandstone, light hard	6	1197
Shale, dark soft	32	843	Shale, dark soft	20	1217
Limestone, light medium..	13	856	Sandstone, light hard	2	1219
Sandstone, light hard	30	886	Shale, light soft	3	1222
Limestone, light medium..	10	896	Limestone, light hard (Glen Dean)	10	1232
Shale, dark soft	50	946	Shale, dark soft (Hardinsburg)	10	1242
Sandstone, light hard	17	962	Sandstone, light hard	48	1290
Shale, dark soft	41	1004	Shale, dark soft	10	1300
Shell, sandy light medium..	1	1005	Limestone, brown hard (Golconda)	8	1308
Shale, dark soft	16	1021	Shale, dark soft (Cypress)	10	1318
Coal, dark soft	5	1026	Sandstone, brown and grey medium	23	1341
Shale, dark soft	5	1031	Shale, dark soft, shelly....	10	1351
Sandstone, light hard (Mansfield)	16	1047			
Shale, dark soft	74	1121			
Sandstone, light hard	25	1146			
Shale, dark soft	5	1151			

Water (6 bailers), 811 feet. Water (hole filled), 945 and 1035 feet. Water, filled 50 feet with gas, 1300 feet. Oil, top of sand, 1318 feet. Oil, first showing, 1322 feet. Production first 24 hours, 6 barrels.

C. L. Muncy Well No. 1. Washington Township. Section 1. Elevation 499 feet. Well completed April 2, 1917.

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Yellow clay, soft	28	28	White sandstone, salt water	40	740
Sand, soft	2	30	Dark shale, soft	20	760
White shale, soft	70	100	White shale, soft	20	780
Dark shale, soft	20	120	White sandstone, hard	16	796
White sandstone, water ...	7	127	Black shale, soft	10	806
White shale, soft	53	180	White shale, soft	29	835
Coal, soft	4	184	White sandstone, water....	30	865
White shale, soft	6	190	Dark shale, soft	10	875
White limestone, hard	5	195	Light sandstone, limy	25	900
White shale, soft	15	210	White limestone, hard	5	905
Dark shale, soft	30	240	White shale, soft	20	925
White sandstone, hard	10	250	White sandstone, water ...	15	940
Dark shale, medium hard..	30	280	White shale, soft	25	965
Coal, soft	5	285	Black shale, soft	35	1000
White shale, soft	10	295	White sandstone, water (Mansfield)	30	1030
White limestone, hard	5	300	White shale, soft	5	1035
Dark shale, soft	30	330	White sandstone, water (Tar Springs)	35	1070
White sandstone, water ...	50	380	White shale, med., hard ...	25	1095
Dark shale, soft	10	390	White sandstone, med., hrd.	25	1120
White limestone, hard	10	400	White shale, soft	5	1125
White shale, soft	10	410	White sandstone, med., hrd.	15	1140
Dark shale, soft	70	480	Dark shale, med., hrd. ...	15	1155
Black shale, soft	10	490	White sandstone, med., hrd.	90	1245
Dark shale, hard	40	530	White shale, med., hrd....	20	1265
White shale, soft	50	580	White limestone, hard (Glen Dean)	7	1272
Dark shale, soft	10	590	Dark shale, soft	13	1285
White limestone, hard	10	600			
Dark shale, soft	50	650			
White shale, soft	50	700			

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
White limestone, hard ...	15	1300	Dark shale, med., hrd. ..	2	1492
Dark shale, soft	5	1305	Dark sandstone, med., hard		
White limestone, hard	5	1310	(Sample)	25	1517
White shale, soft	5	1315	Dark shale, med., hard ...	15	1532
White limestone, hard (Golconda)	45	1360	Brown limestone, hard		
White shale, soft	25	1385	(Beaver Bend)	6	1538
White sandstone, water			Dark shale, hard (Mooretown)	9	1547
(Cypress)	70	1455	Dark sandstone, broken ..	3	1550
White limestone, hard			Blue sandstone, hard	8	1558
Beech Creek)	10	1465	Brown sandstone, oil	4	1562
Dark shale, soft (Elwren). .	20	1485	Blue sandstone, hard	3	1565
Brown sandstone, hard ...	5	1490	White sandstone, water ..	2	1567

Water, 250 feet in hole, 380 feet. Water, hole filled, 1390 feet. Gas, small showing, 1490 feet. Gas and oil, 1510-1515 feet.

Casing Record—16-inch, 28 feet; 12½-inch, 382 feet; 10-inch, 1000 feet; 8¼-inch, 1344 feet; 6½-inch, 1488 feet.

O. J. Nixon Well No. 1. Washington Township. Donation 123. Elevation 525.59 feet. Well completed September 10, 1917.

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Yellow mud	34	34	White shale	30	880
White mud	36	70	White sandstone (Mansfield)	40	920
Red rock	5	75	White shale	20	940
Gray shale	25	100	Brown limestone	24	964
White mud	50	150	Sandstone	26	990
Shale	35	185	Brown shale	35	1025
Sandstone	5	190	White shale	75	1100
Light shale	75	265	Sandstone	35	1135
Sandstone, water	25	290	Limestone (Siberia)	7	1142
Shale	30	320	Sandstone (Tar Springs) ..	103	1245
Coal	7	327	Black shale (Glen Dean) ..	20	1265
White shale	8	335	Limestone	1	1266
Sandstone and shale	65	400	Black shale (Hardinsburg) ..	54	1320
Limestone	6	406	White shale	22	1342
Light shale	94	500	Black shale	16	1358
White shale	20	520	Limestone (Golconda)	12	1370
Black shale	45	575	Sandstone	20	1390
White shale	9	584	Black shale	20	1410
White limestone	6	590	Sandstone, water (Cypress) ..	85	1495
White shale	30	620	Shale	5	1500
Black shale	14	634	Limestone	5	1505
White shale	16	650	Black shale, sandy (Beech Creek)	10	1515
Blue shale	55	705	Limestone	10	1525
White shale	30	735	Black shale (Elwren)	37	1562
Sandstone, water	15	750	Limestone (Reelsville) ...	13	1575
White shale	25	775	Sandstone, oil (Sample) ..	19	1594
Limestone	20	795			
White shale	5	800			
White sandstone	50	850			

Water, hole filled, 735 feet. Water, 1495 feet. Production first 12 hours, 85 barrels.

Casing Record—12½-inch, 400 feet; 10-inch, 990 feet; 8¼-inch, 1263 feet; 6½-inch, 1561 feet.

O. J. Nixon Well No. 2. Washington Township. Donation 123. Elevation 489 feet. Well completed November 28, 1917.

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Yellow clay	15	15	Black shale	45	980
Black shale	5	20	Limestone	25	1006
White shale	8	28	Shale	76	1082
Limestone, shell	5	33	Limestone (Siberia)	10	1092
White shale, soft	37	70	Sandstone (Tar Springs)..	98	1190
White limestone, hard ...	10	80	Black shale	50	1240
Shale	60	140	Limestone (Glen Dean) ..	15	1255
Sandstone	10	150	Shale (Hardinsburg)	50	1305
White shale	32	182	Limestone (Golconda) ...	10	1315
Coal	3	185	Shale	10	1325
White shale	65	250	Limestone	15	1340
White sandstone, water ..	20	270	Shale	50	1390
Shale	30	300	Sandstone, salt (Cypress) .	80	1470
Coal	4	304	Black shale (Beech Creek) 4		1474
Shale	92	396	Limestone	6	1480
Limestone	10	406	Black shale (Elwren)	30	1510
Shale	144	550	Limestone	4	1514
Sandstone	15	565	Black shale	10	1524
Shale	63	628	Brown limestone, hard		
Coal	5	633	(Reelsville)	7	1531
Shale	77	710	Gray sandstone, coarse		
Coal	3	713	(Sample)	5	1536
Shale	27	740	Light sandstone, fine	4	1540
Sandstone	20	760	Light sandstone, coarse ...	5	1545
Black shale	55	815	White sandstone, med. fine	4	1549
Sandstone (Mansfield) ...	37	852	White sandstone, fine	3	1552
Dark shale	35	887	White sandstone, very fine	1	1553
White shale	48	935	White sandstone, very fine	1½	1554½

Water, 4 bailers per hour, 270 feet. Water, 2 bailers in coal, 633 feet. Water, 713 feet. Oil sand, good, 1545 feet. Production first 24 hours, pumped and flowed, 55 barrels.

Casing Record—16-inch, 41 feet; 12½-inch, 384 feet; 8¼-inch, 1014 feet; 6½-inch, 1524 feet.

O. J. Nixon Well No. 3. Washington Township. Donation 122. Elevation 486 feet. Well completed October 2, 1917.

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Soil, dark	2	2	Sandstone	15	395
Clay, yellow	28	30	Shale	35	430
Shale, dark	90	120	Sandstone, white	25	455
Sand, white	10	130	Shale, black	18	473
Shale, dark	30	160	Limestone, white	13	486
Coal	5	165	Shale, light	19	505
Shale, light	15	180	Limestone, dark	5	510
Limestone, gray	55	235	Shale, dark	10	520
Sandstone, white, water ..	10	245	Shale, light	20	540
Shale, dark	20	265	Limestone, gray	5	545
Shale, black	5	270	Sandstone, white	20	565
Limestone, blue	5	275	Shale, light	5	570
Shale, light	13	288	Shale, dark	10	580
Limestone, white	8	296	Limestone, white	5	585
Sandstone, white	56	352	Shale, dark	15	600
Shale, dark	28	380	Shale, light	5	605

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Shale, dark	35	640	Sandstone, white	8	1258
Limestone, dark	7	647	Shale, light	22	1280
Shale, dark	13	660	Limestone, gray, hard ...	4	1284
Shale, light	8	668	Shale, dark	28	1312
Sandstone, white	9	677	Limestone, blue, hard ...	8	1320
Shale, light	6	683	Limestone, brown, hard ..	10	1330
Sandstone, light	42	725	Limestone, gray, hard (Gol- conda)	25	1355
Shale, light	45	770	Shale, light	30	1385
Shale, dark	5	775	Sandstone, white, water (Cypress)	21	1406
Shale, light	5	780	Shale, black	3	1409
Sandstone, white	20	800	Sandstone, light, water ..	34	1443
Shale, light	35	835	Limestone, light, hard (Beech Creek)	9	1452
Sandstone, white	13	848	Shale, light, soft	8	1460
Shale, light	22	870	Shale, dark	7	1467
Limestone, white	5	875	Limestone, gray, hard ...	10	1477
Shale, light	15	890	Shale, dark, soft (Elwren)	27	1504
Shale, dark	20	910	Limestone, gray, hard (Reelsville)	6	1510
Sandstone, white	30	940	Shale, dark, soft	10	1520
Shale, dark	45	985	Limestone, brown, hard ..	3	1523
Limestone, gray, hard ..	5	990	Shale, dark, soft (Sample)	8	1531
Shale, light	15	1005	Sandstone, gray	11	1542
Sandstone, light hard (Mansfield)	20	1025	Sandstone, gray	7	1549
Shale, black	10	1035	Sandstone, light	3	1552
Limestone, gray, hard ...	20	1055	Sandstone, darker	3	1555
Shale, dark	20	1075	Sandstone, lighter	4	1559
Limestone, white, hard ..	8	1083	Sandstone, lighter	6	1565
Shale, black, soft	22	1105	Shale	3	1568
Limestone, white	25	1130	Sandstone, water	1½	1569½
Sandstone, white (Tar Springs)	90	1220			
Shale, dark	30	1250			

Water, hole filled, 240, 915 and 1406 feet. Water, 3 bailers per hour, 595 feet. Gas, light, 1320 feet. Oil, top of sand, 1531 feet. Oil, first showing, 1542 feet. Oil, 1549 feet. Production first 24 hours, 48 barrels.

Casing Record—16-inch, 24 feet; 12½-inch, 357 feet; 8¼-inch, 985 feet; 6½-inch, 1516 feet.

O. J. Nixon Well No. 4. Washington Township. Donation 122. Elevation 463 feet. Well completed July 4, 1918.

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Dark soil, soft	1	1	Light shale, soft	22	347
Yellow clay, soft	25	26	Gray sandstone, soft	15	362
Quick sand, soft	7	33	Light shale, soft	18	380
White mud, soft	17	50	Dark shale, soft	45	425
Light shale, soft	25	75	Light shale, soft	15	440
Dark shale, soft	73	148	Black shale, soft	10	450
Coal, soft	3	151	Light shale, soft	25	475
Dark shale, soft	56	207	Dark shale, soft	20	495
Light sandstone, soft	23	230	Gray limestone, hard	12	507
Dark shale, soft	13	243	Dark shale, soft	16	523
Gray limestone, hard	5	248	Dark limestone, hard	16	539
Coal, soft	4	252	Dark shale, soft	20	559
Light shale, soft	16	268	Light shale	21	580
Gray sandstone, hard	39	307	Dark shale	15	595
Dark shale, soft	18	325	Gray limestone, hard	5	600

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Dark shale, soft	20	620	Gray limestone, hard	2	1214
Gray limestone, hard ...	4	624	Dark shale, soft	6	1245
Dark shale, soft	6	630	Light sandstone, soft		
Light shale	60	690	(Hardinsburg)	15	1260
Gray sandstone, hard	4	694	Dark shale, soft	5	1265
Dark shale, soft	22	716	Gray limestone, hard	70	1335
Gray limestone, hard	3	719	Dark shale, soft	10	1345
Dark shale, soft	14	733	Gray limestone, hard (Gol-		
Gray limestone, hard			conda)	10	1355
broken	17	750	Dark shale, soft	9	1364
Dark shale, soft	30	780	Light sandstone, hard (Cy-		
Light sandstone, hard ...	16	796	press)	60	1424
Light shale, soft	2	798	Gray limestone, hard		
Light sandstone, hard ...	15	813	(Beech Creek)	9	1433
Gray limestone, hard ...	37	850	Dark shale, soft	7	1440
Dark shale, soft	5	855	Red rock, soft	2	1442
White sandstone, soft ...	18	873	Dark shale, soft	8	1450
Dark shale, soft	2	875	Gray limestone, hard ...	2	1452
White sandstone, soft ...	10	885	Dark shale, soft (Elwren)	36	1488
Dark shale, soft	38	923	Gray limestone, hard		
Gray limestone, hard	32	955	(Reelsville)	5	1493
White sandstone, soft			Brown limestone	8	1501
(Mansfield)	25	980	Dark shale, soft	3	1504
Gray sandstone, hard	25	1005	Gray sandstone, hard		
White sandstone, soft ...	13	1018	(Sample)	8	1512
Gray limestone, hard	14	1032	Gray sandstone, broken ..	9	1521
White sandstone, soft ...	25	1057	Light sandstone, soft ...	34	1555
Coal, soft	2	1059	Dark sandstone, soft	3	1558
Gray limestone, hard ...	31	1090	Dark shale, soft	2	1560
Dark shale, soft	10	1100	Red rock, soft	9	1569
Light sandstone, soft (Tar			Gray sandstone, soft	13	1582
Springs)	105	1205			
Dark shale, soft (Glen					
Dean)	7	1212			

Water, 5 bailers per hour, 800 feet. Water, hole filled, 865 feet.
Gas, first (Sample), 1508 feet. Plugged.

Casing Record—12½-inch, 315 feet; 10-inch, 926 feet; 8¼-inch, 1214 feet; 6⅝-inch, 1493 feet.

O. J. Nixon Well No. 6. Washington Township. Military donation
122. Elevation 473.47 feet. Well completed January 7, 1920.

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Soil, soft, dark	6½	6½	Limestone, hard, gray	5	246
Clay, soft, yellow	9½	10½	Shale, soft, dark	9	255
Shale, soft, dark	26	36	Coal, soft	4	259
Sandstone, soft, dark ...	10	46	Shale, soft, light	7	266
Shale, soft, light	34	80	Limestone, hard, white ...	24	290
Shale, soft, dark	34	114	Sandstone, hard, light ...	19	309
Limestone, hard, gray ...	4	118	Shale, soft, dark	15	324
Shale, light, soft	35	153	Shale, soft, light	15	339
Limestone, hard, gray ...	6	159	Limestone, hard, black ...	3	342
Shale, soft, light	29	188	Shale, soft, dark	10	352
Coal, soft	2	190	Limestone, hard, white ..	25	377
Shale, soft, light	38	228	Shale, soft, light	15	392
Sandstone, hard, light ...	2	230	Shale, soft, dark	13	405
Shale, soft, dark	11	241	Sandstone, hard, light ...	8	413

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Shale, soft, dark	32	445	Shale, soft, dark	9	1011
Shale, soft, light	15	460	Limestone, hard, light ...	19	1030
Shale, soft, dark	30	490	Sandstone, hard, light ...	37	1067
Limestone, hard, white ...	12	502	Shale, soft, dark	3	1070
Shale, soft, dark	15	517	Limestone, hard, light ...	65	1135
Shale, soft, light	23	540	Sandstone, hard, light (Tar Springs)	75	1210
Limestone, hard, dark ...	10	550	Shale, soft, dark	8	1218
Shale, soft, dark	5	555	Shale, soft, light	8	1226
Shale, soft, light	25	580	Sandstone, hard, light ...	2	1228
Coal, soft	5	585	Shale, soft, dark	12	1240
Shale, soft, dark	12	597	Limestone, hard, light ...	5	1245
Limestone, hard, gray ...	3	600	Shale, soft, dark	2	1247
Shale, soft, light	20	620	Limestone, hard, light (Glen Dean)	15	1262
Shale, soft, dark	25	645	Shale, soft, light (Hardins- burg)	31	1293
Limestone, hard, dark ...	4	649	Limestone, hard, light (Gol- conda)	42	1335
Shale, soft, light	16	665	Shale, soft, dark (Indian Springs)	27	1362
Sandstone, hard, light ...	5	670	Sandstone, hard, light (Cy- press)	78	1440
Shale, soft, dark	45	715	Shale, soft, light (Beech Creek)	5	1445
Sandstone, hard, gray ...	5	720	Red rock, soft	2	1447
Shale, soft, light	10	730	Shale, soft, dark (Elwren)	53	1500
Limestone, hard, white ...	28	758	Limestone, hard, brown (Reelsville)	4	1504
Shale, soft, dark	26	784	Shale, soft, dark (Sample)	22	1526
Shale, soft, light	6	790	Sandstone (Cunningham) .	10	1536
Sandstone, hard, light ...	45	835	Oil, pay	1544 to	1556
Shale, soft, light	5	840	Sandstone, med. light ...	3	1559
Sandstone, hard, light ...	11	851	Shale, soft, dark	2	1561
Shale, soft, dark	14	865			
Limestone, hard, white ...	5	870			
Water, sand, med. light ...	25	895			
Shale, soft, dark	31	926			
Limestone, hard, gray ...	21	947			
Sand, hard, light, water ...	43	990			
Shale, soft, dark	2	992			
Limestone, hard, gray ...	10	1002			

Water, hole full from 36 to 46 feet. Water, 1 bailer per hour, 7 to 10 feet. Water, hole filled, 880, 968 and 1365 feet. Oil, first showing, 1544 feet. Production first 24 hours, 12 barrels.

Casing Record—16-inch, 40 feet; 12½-inch, 340 feet; 10-inch, 927 feet; 8¼-inch, 1240 feet; 6½-inch, 1500 feet.

Edith Hyneman Well No. 1. Washington Township. Section 12. Elevation 511 feet. Completed May 20, 1918.

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Soil, soft	1	1	Light shale, soft	32	312
Yellow clay, soft	15	16	Gray limestone, hard ...	10	322
Light shale, soft	8	24	Coal	10	332
Light sandstone, soft	36	60	Light sandstone, soft	10	342
Light shale, soft	15	75	Gray limestone, hard ...	3	345
Dark shale, soft	45	120	Dark shale, soft	55	400
White limestone, hard ...	10	130	Gray limestone, hard, gritty	10	410
White sandstone, soft ...	50	180	Gray limestone, hard, gritty	5	415
Dark shale, soft	50	230	Light shale, soft	30	445
Light shale, soft	10	240	White limestone, hard ...	10	455
White limestone, hard ...	10	250	White shale, soft	45	500
Light shale, soft	15	265	Black shale, soft	10	510
White limestone, hard	15	280	Light shale, soft	40	550

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Dark shale, soft	30	580	Dark shale, soft	10	1280
Light limestone, hard	5	585	White limestone, soft	5	1285
Light shale, soft	115	700	Dark shale, soft (Hardins- burg)	50	1335
Dark shale, soft	10	710	Light shale, soft	10	1345
Light sandstone, soft	25	735	Light limestone, sandy (Golconda)	30	1375
Dark shale, soft	40	775	Light shale, soft	35	1410
Light limestone, hard ...	10	785	White limestone, hard	5	1415
Light shale, soft	85	870	Dark shale, soft	10	1425
Dark shale, soft	22	892	White sandstone, soft (Cy- press)	40	1465
Light limestone, hard	23	915	Limestone, hard	10	1475
Dark limestone, hard	10	925	Dark shale, soft (Beech Creek)	10	1485
Dark shale, soft	25	950	Brown limestone, hard ...	3	1488
Light sandstone, soft (Mansfield)	15	965	Blue shale, soft	5	1493
Black shale, soft	10	975	Red rock, soft (Elwren)...	2	1495
Light shale, soft	35	1010	Dark shale, soft	8	1503
White sandstone, soft	75	1085	Light limestone, hard (Reelsville)	4	1507
White limestone, hard (Si- beria)	5	1090	Gas sand, soft		1507
Dark shale, soft (Tar Springs)	15	1105	Gas sand, light (Sample) ..	11	1518
Light limestone, hard ...	10	1115	Brown sandstone, oil	17	1535
Light shale, soft	31	1146	White sandstone, soft	2	1537
Light sandstone, soft	44	1190	Dark shale, soft	32	1569
Dark shale, soft	5	1195	Blue sandstone, hard	11	1580
White limestone, hard ...	5	1200	Dark shale, soft	21	1601
Dark limestone, gritty (Glen Dean)	45	1245			
White limestone, hard, sandy	25	1270			

Water, 60, 410 and 730 feet. Water, 10 bailers per hour, 965 feet.
Water, hole filled, 1020 and 1425 feet.

Casing Record—16-inch, 24 feet; 12½-inch, 345 feet; 10-inch, 975 feet; 8¼-inch, 1280 feet; 6⅝-inch, 1503 feet.

Wm. Hyneman Well No. 1. Washington Township. Donation 121
Elevation 452 feet. Well completed October 24, 1917.

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Yellow mud	30	30	Coal	10	580
Black shale, soft	10	40	White shale, soft	70	650
White sandstone, broken..	25	65	White sandstone, hard ...	15	665
Black shale, soft	40	105	Black shale, soft	50	715
White shale, soft	30	135	White limestone, hard ...	10	725
White limestone, broken ..	20	155	White sandstone, hard ...	20	745
Black shale, soft	10	165	Gray shale, soft	55	800
Brown limestone, hard ...	15	180	White sandstone, hard (Mansfield)	50	850
Black shale, soft	40	220	Gray shale, soft	30	880
White sandstone, soft	40	260	White limestone, hard, sandy	20	900
White sandstone, hard ...	30	290	Black shale, soft	30	930
Black shale, soft	35	325	White shale, hard	15	945
White sandstone, soft	20	345	White limestone, hard, sandy	15	960
Black shale, soft	10	435	Gray shale, soft	20	980
White limestone, broken ..	10	445	Lime shale, hard (Siberia)	5	985
White shale, soft	20	465			
White limestone, hard ...	2	467			
White shale, soft	103	570			

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
White sandstone, hard (Tar Springs)	30	1015	Brown sandstone	5	1310
Blue shale, soft	15	1030	Blue shale, soft	55	1365
White sandstone, hard ...	20	1050	Sand, white, soft (Cypress) ..	50	1415
White limestone, hard ...	10	1060	Blue shale, soft	5	1420
Gray shale, hard	15	1065	White limestone, hard (Beech Creek)	10	1430
White limestone, hard ...	15	1080	Blue shale, soft	4	1434
White shale, soft	25	1105	Red rock	1	1435
White limestone, hard (Glen Dean)	10	1115	Blue shale, soft (Elwren) ..	50	1485
White mud, soft	30	1145	Gray limestone, broken (Reelsville)	5	1490
White limestone, hard ...	5	1150	Light shale (Sample) ...	21	1511
Light shale, soft (Hardins- burg)	20	1170	Light sandstone, brown, coarse	5	1516
Light sandstone, soft	35	1205	Light sandstone, brown coarse, finer	5	1521
White shale, soft	40	1245	Sandstone, shale, broken .	4	1525
White sandstone, soft ...	10	1255	Light sandstone, med. coarse	3	1528
Dark shale, soft	20	1275	Light sandstone, very fine	2	1530
White limestone, hard (Gol- conda)	5	1280	Light sandstone, very fine	3	1533
White shale, soft	10	1290			
White limestone, hard ...	15	1305			

Water, 580 feet. Water, hole filled, 1415 feet. Oil, little show, 1310 feet. Oil, first showing, 1512 feet. Oil, best pay from 1516 to 1521 feet. Production first 24 hours, 95 barrels.

Casing Record—16-inch, 26 feet; 12½-inch, 335 feet; 10-inch, 956 feet; 8¼-inch, 1275 feet; 6⅝-inch, 1443 feet.

Mary Shawhan Well No. 1. Washington Township. Section 1. Well completed July 28, 1919.

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Clay, yellow, soft	42	42	Sandy limestone, dark, hard	6	423
Shale, light, soft	6	48	Shale, light, soft	77	500
Limestone, gray, hard ...	3	51	Sandstone shale, dark, soft	20	520
Shale, light, soft	9	60	Shale, dark, soft	25	545
Shale, dark, soft	8	68	Shale, light, soft	10	555
Shale, light, soft	3	71	Shale, dark, soft	33	588
Limestone, light, hard ...	4	75	Shale, light, soft	14	602
Shale, light, soft	25	100	Shale, dark, soft	13	615
Coal, black, soft	4	104	Shale, light, soft	15	630
Shale, light, soft	72	176	Limestone, dark, hard ...	2	632
Limestone, dark, hard ...	4	180	Shale, dark, soft	18	650
Shale, light, soft	43	223	Shale, light, soft	12	662
Coal, soft	2	225	Shale, dark, soft	88	750
Shale, light, soft	5	230	Shale, light, soft	20	770
Sandstone, light, soft	10	240	Shale, dark, soft	5	775
Shale, dark, soft	14	254	Sandstone, light, hard ...	5	780
Sandstone, light, soft ...	15	269	Shale, dark, soft	7	787
Sandy limestone, gray, hard	5	274	Limestone, gray, hard ...	3	790
Shale, light, soft	2	276	Shale, dark, soft	45	835
Limestone, gray, hard ...	3	279	Sandy limestone, hard, gray	4	839
Shale, soft, dark	25	306	Shale, dark, soft	59	898
Coal, soft	4	309	Limestone, light, hard ...	3	901
Shale, dark, soft	108	417			

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Shale, dark, soft	39	940	Sandstone, limestone, hard, gray	8	1410
Sandstone, limestone, hard, gray	8	948	Shale dark, hard	13	1423
Shale, dark, soft	32	980	Limestone, gray, hard (Cy- press)	1	1424
Sandy limestone, hard, light	35	1015	Gas sand, coarse, grey, medium hard	6	1430
Shale, dark, soft	30	1045	Water sand, soft, white ..	60	1490
Sandstone, gray, hard ...	30	1075	Limestone, gray, hard (Beech Creek)	8	1498
Sandstone, light, hard ...	28	1103	Shale, dark, soft	6	1504
Shale, dark, soft	11	1114	Limestone, gray, hard	2	1506
Sandstone, light, hard ...	37	1151	Shale, dark, soft (Elwren)	6	1512
Shale, dark, soft	7	1158	Limestone, dark, hard (Reelsville)	17	1529
Sandstone, gray, hard ...	37	1195	Shale, dark, soft (Sample)	2½	1531½
Shale, dark, soft	5	1200	Sandstone, light, soft	1	1532½
Sandstone, gray, hard ...	16	1216	Sandstone, light, hard	4½	1537
Shale, dark, soft	2	1218	Sandstone, limestone, hard, gray	2	1539
Salt sandstone, light, soft (Tar Springs)	76	1294	Sandstone, light, hard ...	11	1550
Shale, dark, soft (Glen Dean)	6	1300	Shale, dark, soft	10	1560
Limestone shell, hard, brown	1	1301	Limestone, brown, hard (Beaver Bend)	9	1569
Shale, dark, soft (Hardins- burg)	37	1338	Shale, dark, soft	3	1572
Sandstone, gray, hard	5	1343	Cunningham sandstone, soft gray (Mooretown)	12	1584
Shale, dark, soft	7	1350	Sandstone, lighter, soft, finer	5	1589
Limestone, gray, hard (Golconda)	23	1373	Sandstone, darker, soft ..	5	1594
Shale, dark, soft (Indian Springs)	11	1384	Sandstone, light, soft, coarser	7	1601
Sandstone, gray, hard	6	1390	Sandstone, light, fine	10	1611
Shale, dark	3	1193	Sandstone, light, coarse ..	1	1612
Limestone, gray, hard ...	7	1400	Shale, dark, soft	5	1617
Shale, light, soft	2	1402			

Water, 4 bailers per hour, 73 feet. Water, 10 bailers per hour, 225 feet. Water, filled, 1436 feet. Gas, showing, 1370 and 1424 to 1430 feet. Gas, 1534 to 1537 and 1540 to 1542 feet. Oil, first showing, 1584 feet; Oil, 1589 to 1594 feet. Water at bottom of oil sand. Plugged.

Casing Record—16-inch, 38 feet; 12½-inch, 420 feet; 10-inch, 942 feet; 8¼-inch, 1315 feet; 6½-inch, 1593 feet.

Washington Township—Wheeling Field. The Wheeling field is located in sections 17, 18, 20 and 29 in T. 1 S., R. 10 W. The field derives its name from the village of Wheeling located in section 19, T. 1 S., R. 10 W., northeast of Princeton in Washington township.

Well Logs from Wheeling Field.

The following are the logs of some of the wells from the Wheeling field. The interpretations of the stratigraphical conditions are by the writer.

Marion Hunt Farm Well No. 5. Washington Township. Section 20.
1096 feet to west line. 200 feet to south line. Completed November 14,
1922.

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Clay, yellow, soft	40	40	Shale, dark, soft	11	985
Shale, dark, soft	219	259	Sandstone, light, med.	8	993
Limestone, dark, hard ...	1	260	Shale, dark, soft (Tar Springs)	67	1060
Coal, black, soft, V	5	265	Sandstone, light, hard ...	35	1095
Shale, dark, soft	15	280	Shale, light, soft	27	1122
Sandstone, light, soft ...	62	342	Sandstone, light, soft	6	1128
Sandstone, light, broken ..	23	355	Shale, dark, soft	14	1142
Shale, dark, soft	30	385	Sandstone, light, hard ...	4	1146
Sandstone, light, hard ...	5	390	Shale, dark, soft	14	1160
Shale, dark, soft	30	420	Sandstone, light, soft	30	1190
Shale, light, soft	17	437	Limestone, gray, hard ...	3	1193
Limestone, light, hard ...	1	438	Sandstone, light, soft	15	1208
Shale, dark, soft	14	452	Shale, dark, soft (Glen Dean)	30	1238
Limestone, light, hard	1	453	Limestone, gray, hard	12	1250
Coal, black, soft, IV, III..	4	457	Shale, dark, soft	13	1263
Shale, shelly, light, med. ..	18	475	Sandstone, light, hard (Hardinsburg)	5	1268
Shale, dark, soft	10	485	Shale, dark, soft	9	1277
Shale, light, soft	18	503	Sandstone, B. gray, soft ..	6	1283
Limestone, light, hard ...	2	505	Sandstone, gray and brown, soft	15	1298
Shale, dark, soft	10	515	Sandstone, light, soft	7	1305
Shale, light, hard	2	517	Sandstone, white, soft	2	1307
Shale, light, soft	68	585	Formation from 6½" casing down:		
Shale, dark, soft	37	622	Sandstone, white, soft ...	3	1346
Sandstone, light, med.	28	650	Limestone, gray, hard (Beech Creek)	27	1373
Coal, black, soft, I	2	652	Shale, dark, soft (Elwren)	12	1385
Sandstone, broken, light, soft	48	700	Red rock, red, soft (Reels- ville)	2	1387
Sandstone, light, soft ...	25	725	Shale, dark, soft	19	1406
Shale, light, soft	10	735	Sand, oil, light, soft	10	1416
Sandstone, light, soft ...	20	755	Sandstone, light, soft (Sample)	34	1450
Shale, dark, soft	27	782	Limestone, light, soft	2	1452
Limestone, dark, hard ...	1	783	Shale, dark, soft (Beaver Bend)	14	1466
Shale, dark, soft	15	798	Limestone, light, hard ...	9	1475
Shale, light, soft	32	830	Sandstone, light, soft (Mooretown)	47	1522
Limestone, dark, soft	26	856			
Limestone, dark, hard	1	857			
Shale, light, hard	5	862			
Limestone, dark, soft	8	870			
Limestone, light, hard	4	874			
Shale, dark, soft	23	897			
Shale, light, hard (Mans- field)	68	965			
Shale, dark, soft	7	972			
Limestone, dark, hard ...	2	974			

Water, 225 and 645 feet. Water, hole filled, 735 and 1085 feet.
Oil, first showing, 1288 feet. Oil, 1305 feet.

Casing Record—12½-inch, 4 pieces, 65 feet 1 inch; 10-inch, 22 pieces,
413 feet; 8¼-inch, 52 pieces, 973 feet; 6⅝-inch, 60 pieces, 1191 feet.

Agnes Haskins Well No. 1. Washington Township. N. W. quarter of the S. E. quarter of section 18, R. 9 W., T. 1 S. Elevation 459 feet.

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Clay, yellow	28	28	Limestone, light	3	968
Shale, light	10	38	Sandstone, light	14	982
Shale, dark	32	70	Sandstone, dark	13	995
Limestone, dark	10	80	Shale, dark	55	1050
Shale, dark	2	82	Limestone, light (Siberia) .	5	1055
Limestone, light	5	87	Shale, light (Tar Springs)	20	1075
Shale, dark	6	93	Broken limestone	5	1080
Limestone, gray	26	119	Sandstone, light	65	1145
Shale, light	7	126	Shale, dark	8	1153
Shale, dark	24	150	Sandstone, light	5	1157
Limestone, light	15	165	Sandstone, gray	16	1173
Shale, light	5	170	Shale, dark	7	1180
Limestone, dark	10	180	Limestone, gray	2	1182
Shale, dark	56	236	Shale, dark	3	1185
Coal V, black	2	238	Sandstone, gray	15	1200
Shale, dark	112	350	Shale, light	7	1207
Brown sandstone, broken..	10	360	Sandstone, light	8	1215
Sandstone, light	40	400	Broken sandstone, hard ..	20	1235
Shale, light	5	405	Shale, dark	20	1255
Limestone, light	5	410	Limestone, light (Glen Dean)	10	1265
Shale, dark	50	460	Water sand, brown (no oil) (Hardinsburg)	16	1301
Broken limestone	5	465	Shale, dark	16	1317
Shale, dark	40	505	Sandstone, light	23	1340
Sandy limestone	3	508	Shale, dark	10	1350
Shale, dark	10	518	Limestone, light (Gol- conda)	15	1365
Limestone, light	5	523	Shale, light	3	1368
Shale, light	62	585	Limestone, brown	17	1385
Broken limestone	9	594	Shale, dark	5	1394
Shale, light	9	603	Shale, green	5	1395
Limestone, light	12	615	Shale, red	8	1403
Shale, dark	85	700	Shale, dark	12	1415
Sandstone, light	45	745	Sandstone, light (Cypress)	37	1452
Shale, dark	75	820	Shale, dark	10	1462
Sandstone, gray	35	855	Limestone, brown (Beech Creek)	12	1474
Shale, dark	15	870	Shale, dark (Elwren)	6	1480
Limestone, gray	5	875			
Shale, dark	15	890			
Limestone, gray	10	900			
Shale, dark	10	910			
Sandstone, light (Mans- field)	55	965			

Water, 170, 350, 982 and 1145 feet. Gas, 1480 feet.

Casing Record—12½-inch, 400 feet; 10-inch, 982 feet; 8¼-inch, 1180 feet; 6½-inch, 1419 feet.

James O'Neal No. 1. Washington Township. Section 20.

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Drift	55	55	Sandstone	25	160
Shale	25	80	Shale	40	200
Coal	4	84	Limestone	7	207
Limestone	6	90	Coal	5	212
Shale	30	120	Limestone	6	218
Shale	5	125	Shale	17	235
Shale	10	135	Limestone	10	245

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Shale	35	280	Red rock	2	1227
Limestone	15	295	Shale	13	1240
Sandstone	25	320	Limestone, gray	5	1245
Shale	50	370	Shale, light	38	1283
Coal	4	374	Sandstone (Hardinsburg) ..	37	1320
Shale	16	390	Shale	7	1327
Sandstone	20	410	Limestone	10	1337
Shale	40	450	Shale	15	1352
Sandstone	40	490	Red rock	5	1357
Shale	10	500	Shale (Hardinsburg)	3	1360
Shale	9	509	Limestone	15	1375
Shale	71	580	Sandstone	5	1380
Limestone	20	600	Limestone (Golconda)	58	1438
Sandstone	40	640	Sandstone (Cypress)	77	1515
Shale	30	670	Limestone	10	1525
Sandstone	30	700	Shale (Beech Creek)	12	1537
Shale	90	790	Sandstone, limestone	5	1542
Limestone	10	800	Shale (Elwren)	10	1552
Shale	40	840	Limestone (Reelsville) ...	5	1557
Sandstone	5	845	Red rock	4	1561
Shale	15	860	Shale	10	1571
Sandstone (Mansfield) ...	76	936	Limestone (Sample)	5	1576
Shale	94	1030	Shale	6	1582
Sandstone	40	1070	Limestone (Beaver Bend) .	11	1593
Shale	30	1100	Red rock (Mooretown) ..	12	1605
Limestone (Siberia)	5	1105	Limestone, yellow, hard		
Sandstone (Tar Springs) ..	95	1200	(Paoli)	31	1636
Shale (Glen Dean)	20	1220	Break—no oil	1	1637
Limestone	5	1225	Lime still in lime	55	1692

Water, 320, 936, 1200, 1320 and 1380 feet. Water, hole filled, 1450 feet.

Oscar O'Neal Well No. 1. Washington Township. Section 20. Elevation 435 feet. Completed September 19, 1917.

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Mud, yellow	38	38	Limestone, dark	7	557
Sand, gray, hard	52	90	Shale, light	43	600
Limestone, gray	2	92	Dark shale	20	620
Coal VI	4	96	Sandstone, light, hard ...	125	745
Shale, light	41	137	Limestone, light	55	800
Limestone, gray	25	152	Shale, dark, broken	105	905
Shale, light	38	190	Sandstone, dark, soft,		
Mud, brown	55	245	water	25	930
Shale, black	20	265	Sandstone, dark, hard		
Limestone, gray	10	275	(Mansfield)	15	945
Mud, broken	30	305	Sandstone, light, hard ...	20	965
Shale, black	15	320	Shale, black	27	992
Limestone, white	10	330	Shale, white	25	1017
Broken sand, light	30	360	Limestone, white	64	1081
Shale, white	20	380	Shale, black (Buffalo Wal-		
Shale, brown	30	410	low)	60	1141
Shale, black	40	450	Limestone, white (Siberia)	5	1146
Shale, light	45	495	Sandstone, dark, broken		
Coal IV	5	500	(Tar Springs)	15	1161
Limestone, light	10	510	Sandstone, dark, soft	10	1171
Shale, light	20	530	Shale, dark, broken	29	1200
Shale, dark	20	550	Shale, dark	10	1210

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Limestone, white	10	1220	Sand, white, water	10	1487
Shale, brown	40	1260	Sandstone, white	33	1520
Shale, black	30	1290	Limestone, white (Beech Creek)	15	1535
Sandstone, white, hole full water	25	1315	Shale, black (Elwren) ...	5	1540
Limestone, white (Glen Dean)	25	1340	Sandstone, broken	10	1550
Shale, white (Hardinsburg)	16	1356	Limestone, broken (Reels- ville)	16	1566
Shale, black	10	1366	Red rock (Sample)	2	1568
Red rock	5	1371	Limestone, gray	4	1572
Limestone, white	25	1396	Shale, blue	8	1580
Shale, white	5	1401	Limestone, white (Beaver Bend)	4	1584
Limestone, white (Gol- conda)	14	1415	Limestone	11	1595
Shale, white (Indian Springs)	30	1445	Red rock	2	1597
Shale, black	10	1455	Limestone	13	1610
Limestone, brown	2	1457	Shale (Mooretown)	5	1615
Sandstone, broken (Cy- press)	20	1477	Limestone	26	1641
			Oil sand	9	1650

Casing Record—10-inch, 972 feet; 8¼-inch, 1210 feet; 6½-inch, 1455 feet.

Oscar O'Neal Well No. 2. Washington Township. Section 20. Elevation 413.06 feet.

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Soil	20	20	Shale, white	110	1175
Shale, blue	20	40	Sandstone, white	20	1195
Shale, dark	20	60	Limestone, white (Glen Dean)	11	1206
Shale, black	60	120	Shale, white (Hardinsburg)	36	1242
Limestone	5	125	Sandstone, white	8	1250
Shale, white	25	150	Sandstone	65	1315
Shale, dark	130	280	Limestone (Golconda) ...	20	1335
Sandstone	75	400	Shale (Indian Springs) ..	15	1350
Shale, dark	5	405	Sandstone (Cypress)	50	1400
Limestone	70	475	Limestone (Beech Creek) .	20	1420
Shale, white	5	480	Rock, red	2	1422
Shale, white	120	600	Shale (Elwren)	18	1440
Sandstone, white	50	650	Sandstone	75	1515
Sandstone, broken	70	720	Shale, dark	13	1528
Limestone	5	725	Sandstone	7	1535
Shale	35	760	Shale, white	20	1555
Sandstone	115	875	Limestone (Beaver Bend) .	10	1565
Shale, white	20	895	Shale	5	1570
Sandstone, white (Mans- field)	65	960	Limestone	8	1578
Shale (Tar Springs)	85	1045	Rock, red	2	1580
Sandstone, white	20	1065			

Water, 650 and 875 feet. Oil showing, 1250 feet.

Casing Record—10-inch, 405 feet; 8¼-inch, 1175 feet.

John Snoultz Well No. 1. Washington Township. Northwest quarter section 20. Elevation 418 feet.

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Yellow clay, soft	18	18	Light sandstone, dry		
White sand, soft	7	25	(Mansfield)	50	971
Dark shale, soft	15	40	Light shale	31	1002
Light shale, soft	20	60	Dark shale	37	1039
White limestone, hard ...	3	63	Brown shale (Buffalo Wal-		
Light shale, nodular, hard	20	83	low)	50	1089
Dark shale, nodular	10	93	Light limestone (Siberia)..	3	1092
White limestone, hard ...	20	113	Light shale (Tar Springs)	13	1105
Unknown	69	182	Light sandstone	30	1135
Light limestone	18	200	Light shale	4	1139
Light shale	12	212	Light limestone	3	1143
Dark shale	18	230	Light sandstone	16	1158
Blue limestone	3	233	Brown shale	21	1179
Dark shale	2	235	Light limestone	16	1195
Unknown	7	242	Light three-quarter shale.	12	1207
Brown shale	15	257	Limestone, light	4	1211
Dark shale	27	284	Light shale	15	1226
Limestone, hard	7	291	Light shale	11	1237
Light shale	15	306	Dark shale	8	1245
Dark shale	25	331	Light limestone	12	1257
Limestone, hard	3	334	Light shale	12	1269
Light shale	45	379	Light limestone, hard ...	4	1273
Light sandstone	20	399	Dark shale	2	1275
Dark shale	15	414	Dark limestone	7	1282
Limestone, light	3	417	Light limestone Glen Dean)	30	1312
Light shale	26	443	Light limestone	4	1316
Black shale	12	455	Dark shale (Hardinsburg)	6	1322
Blue limestone	17	472	Light sandstone	4	1326
Unknown	20	492	Light limestone	58	1384
Light limestone	13	505	Dark shale	18	1402
Dark shale	70	575	Light shale	15	1417
Limestone, hard	5	580	Light limestone	9	1426
Light shale	40	620	Brown shale	20	1446
Light limestone	30	650	Brown limestone (Gol-		
Light shale	15	665	conda)	13	1459
Light limestone	4	669	Dark shale	16	1475
White sandstone, water ..	18	687	Light limestone	6	1481
Light shale	13	700	Light shale (Indian		
Gray sandstone	7	707	Springs)	24	1505
Light shale	20	727	Light sandstone (Cypress)	41	1546
Dark limestone	8	735	Light limestone, broken		
Light shale	15	750	(Beech Creek)	12	1558
Dark shale	25	775	Brown limestone	15	1573
Limestone, hard	4	779	Dark shale (Elwren)	25	1598
Dark shale	15	794	Red rock	2	1600
Gray sandstone	7	801	Gray limestone (Beaver		
Brown shale	25	826	Bend)	60	1660
Light limestone	4	830	Gray sandstone, broken		
Brown shale	55	885	(Mooretown)	2	1662
Blue limestone	3	888	Dark shale	1	1663
Dark shale	25	913	Light limestone	27	1690
White limestone	8	921	Brown sandstone, oil	7	1697

Water, 5 bailers per hour, 385 feet. Water, 10 bailers per hour, 675 feet. Oil, small showing, 1546 feet. Oil, small showing, 1660 to 1662 feet. Oil, 1697 feet.

Casing Record—12½-inch, 309 feet; 10-inch, 1002 feet; 8¼-inch, 1360 feet; 6⅞-inch, 1565 feet.

Geo. Shoultz Well No. 1. Washington Township. Section 18. Elevation 456 feet. Drilling commenced December 4, 1920.

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Clay, soft	25	25	Sandstone, gray, hard ...	10	1085
Shale, dark, soft	30	55	Sandstone, hard (Mans- field)	65	1150
Limestone, shale, hard ...	10	65	Shale, dark, soft	36	1180
Shale, light, soft	5	70	Sandstone, gray, hard ...	20	1200
Limestone, light, hard ...	5	75	Shale, dark, soft	17	1217
Shale, light, soft	100	175	Sandstone, gray, hard ...	7	1224
Limestone, gray, hard ...	5	180	Sandstone, gray, med. ...	5	1229
Shale, light soft	40	220	Shale, dark, soft	5	1234
Shale, dark, soft	10	230	Shale (Buffalo Wallow) ..	10	1244
Shale, light, soft	20	250	Sandstone, gray, soft	11	1255
Shale, dark, soft	10	260	Limestone, gray brown (Si- beria)	10	1265
Shale, light, soft	25	285	Shale, dark, sandy	37	1302
Shale, dark, soft	65	350	Sandstone, gray, soft (Tar Springs)	23	1325
Limestone, shale, hard ...	5	355	Shale, dark, soft	2	1327
Shale, light, soft	15	370	Sandstone, gray, soft	28	1355
Sandstone, light, hard ...	5	375	Limestone, brown (Glen Dean)	23	1378
Sandstone, light, soft	20	395	Shale, dark, soft	9	1387
Shale, light, soft	30	425	Rock, red, soft	3	1390
Shale, dark, soft	5	430	Shale, dark, soft	13	1403
Shale, black, muck	10	440	Sandstone, gray, soft (Hardinsburg)	30	1433
Shale, light, hard	5	445	Shale, dark, soft	4	1437
Limestone, gray, hard ...	5	450	Sandstone, gray	7	1444
Sandstone, top hard	5	455	Shale, black, soft	4	1448
Sandstone, bottom hard ..	5	460	Limestone, brown, hard (Golconda)	14	1462
Shale, soft, hard	10	470	Shale	6	1468
Shale, black, soft	5	475	Limestone, hard	3	1471
Shale, light, soft	30	505	Shale (Indian Springs) ..	2	1473
Shale, dark, soft	15	520	Sandstone, gray	7	1480
Shale, light, soft	30	550	Shale, light, soft	2	1482
Shale, dark, soft	15	565	Sandstone, brown (Cypress)	103	1585
Shale, light, soft	20	585	Limestone, brown, hard (Beech Creek)	17	1602
Shale, dark, soft	5	590	Shale, soft (Elwren)	10	1612
Shale, light, soft	20	610	Limestone, hard (Reels- ville)	15	1627
Limestone, shale, hard ...	10	620	Rock, red	2	1629
Shale, light, soft	10	630	Limestone, broken	17	1646
Shale, dark, soft	15	645	Shale, green (Sample) ...	8	1654
Limestone, shale, hard ...	1	646	Limestone, hard	29	1683
Sandstone, gray, hard ...	30	676	Shale, soft	2	1685
Shale, light, soft	31	707	Limestone, sandy, hard (Beaver Bend)	19	1704
Shale, light, sandy	33	740	Sandstone, gray (Moore- town)	6	1710
Shale, light, soft	35	775			
Sandstone, light, soft	15	790			
Shale, light, soft	10	800			
Sandstone, gray, soft	20	820			
Shale, light, soft	50	870			
Shale, light, soft	60	930			
Sandstone, gray, soft	60	990			
Limestone, sandy, hard ...	14	1004			
Shale, dark, soft	60	1064			
Limestone, gray, hard	11	1075			

Water, 930, 1150 and 1585 feet. Gas, 1480 feet. Oil showing, 1087 feet. Oil, 1710 feet.

J. W. Eads Well No. 1. Washington Township. Section 17. Elevation 465 feet. Well completed May 30, 1918.

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Yellow clay	18	18	Limestone, shelly (Siberia)	2	1019
Blue shale	32	50	Brown shale (Tar Springs)	61	1080
Gray limestone	15	65	Gray limestone, sandy	11	1091
Coal	2	67	Gray limestone	39	1130
Gray limestone	33	100	Black shale	50	1180
Shale, soft	45	145	White shale	110	1290
Shale	12	157	Gray sandstone	20	1310
Black shale	7	164	Black shale	14	1324
Gray shale	11	175	Brown limestone, shelly...	4	1328
White shale	65	240	Dark shale, soft (Golconda)	4	1332
Gray shale	10	250	White limestone, hard	4	1336
Black shale	50	300	Black shale, soft (Indian		
Gray sandstone	60	360	Springs)	39	1375
Black shale	55	415	Yellow sandstone	30	1405
Gray limestone	12	427	Dark shale	57	1462
White shale	38	465	White sandstone (Cypress)	38	1500
Limestone, shelly	3	468	Dark shale	5	1505
White shale	44	512	Gray limestone, hard		
White limestone, hard	8	520	(Beech Creek)	60	1565
Black shale	50	570	Red rock, soft (Sample)..	5	1570
White shale, hard	5	575	Gray limestone, hard	10	1580
White shale	40	615	Dark shale, soft	5	1585
Brown limestone, broken..	40	655	Gray limestone, hard	8	1593
Black shale	25	680	Red rock, soft	14	1607
Brown limestone, broken..	75	755	Dark limestone, hard		
Brown shale	130	885	(Beaver Bend)	40	1647
Gray sandstone	46	931	Dark shale, soft (Moore-		
Yellow shale, soft	2	933	town)	2	1649
Gray sandstone (Mansfield)	22	955	Blue sandstone, hard	3	1652
Black shale, break	2	957	Gray sandstone, hard	20	1672
Gray sandstone	28	995	Gray sandstone, hard	3	1675
Black shale (Buffalo Wal-			Brown sandstone, soft ...	2	1677
low)	22	1017	Blue sandstone, hard	24	1701

Water, hole filled up at 925, 1180 and 1468 feet. Water at 1091 and 1675 feet. Oil showing, 1677 feet. At 1701 crevice in rock, hole filled with water. Plugged.

Casing Record—12½-inch, 276 feet; 10-inch, 1005 feet; 8¼-inch, 1324 feet; 6½-inch, 1608 feet; 5⅓-inch, 1671 feet.

Marion Hunt Well No. 1. Washington Township. Section 17. Well completed November 27, 1918.

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Yellow clay, soft	20	20	Light limestone, hard	5	180
Clay and gravel, soft	20	40	Light shale, soft	10	190
Coal, soft	2	42	Grey limestone, hard	20	210
Shale, dark	18	60	Black shale, soft	30	240
Yellow sandstone, soft ...	2	62	Light shale, soft	20	260
Coal, soft	2	64	Black shale, soft	16	276
Dark shale, soft	11	75	Grey limestone, hard	8	284
Light shale, soft	30	105	Coal, soft	7	291
Dark shale, soft	20	125	Grey shale, soft	49	340
Light shale, soft	25	150	Grey sandstone, soft	50	390
Dark shale, soft	25	175	Black shale, soft	10	400

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Coal, soft	4	404	Dark shale, soft (Hardins-		
Light shale, soft	36	440	burg)	20	1300
Black shale, soft	10	450	Light sandstone, soft	21	1321
Light shale, soft	10	460	Light shale, soft	6	1327
Light sandstone, soft	5	465	Light limestone, hard	1	1328
Light limestone, hard	5	470	Light shale, soft	22	1350
Light shale, soft	25	495	Grey limestone, hard (Gol-		
Dark shale, soft	30	525	conda)	29	1379
Light shale, soft	15	540	Brown shale, soft (Indian		
Light limestone, hard	6	546	Springs)	5	1384
Light shale, soft	5	551	Black shale, soft	21	1405
Light limestone, hard	7	558	Sandy limestone, hard (Cy-		
Light shale, soft	17	575	press)	15	1420
Grey sandstone, soft	15	590	White sandstone, soft	40	1460
White shale, soft	50	640	Shelly shale, hard	25	1485
White limestone, hard	170	810	Dark limestone, hard (Beech		
Light shale, soft	65	875	Creek)	25	1510
Dark shale, soft	50	925	Dark shale, soft (Elwren).	5	1515
Light sandstone, soft			White limestone, hard	15	1530
(Mansfield)	59	984	White sandstone, broken ..	6	1536
Dark shale, soft	6	990	White limestone, hard		
Grey limestone, hard	7	997	(Reelsville)	14	1550
Dark shale, soft (Buffalo			Red rock, soft (Sample)..	3	1553
Wallow)	58	1055	Dark shale, soft	2	1555
Sandy limestone, hard (Si-			Brown limestone, hard ...	13	1568
beria)	15	1070	Black shale, hard	22	1590
Light sandstone, hard (Tar			Grey limestone, hard		
Springs)	85	1155	(Beaver Bend)	30	1620
Dark shale, hard	25	1180	Red rock (Mooretown) ...	4	1624
Light sandstone, hard (Glen			White limestone, hard	41	1665
Dean)	75	1255	Grey limestone, soft	10	1675
Dark limestone, hard	10	1265	Grey limestone, hard		
Dark shale, soft	5	1270	(Paoli)	16	1691
Dark limestone, hard	10	1280	White limestone, hard	38	1729
			Grey limestone, hard	6	1731

Water, filled up at 60 feet. Dry.

Casing Record—16-inch, 78 feet; 12½-inch, 185 feet; 10-inch, 995 feet; 8¼-inch, 1357 feet; 6⅞-inch, 1555 feet.

Marion Hunt Well No. 2. Washington Township. Section 20. Completed August 31, 1920.

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Sand, soft yellow	1	1	Sandstone, light hard	25	300
Clay, soft yellow	9	10	Limestone, light hard	10	310
Shale, dark soft	51	61	Sandstone, light medium ..	12	322
Shale, dark soft	114	175	Shale, light soft	10	332
Sandstone, light medium..	5	180	Shale, dark soft	13	345
Shale, dark soft	29	209	Broken sandstone, light		
Limestone, dark hard	3	212	medium	23	368
Shale, dark soft	2	214	Shale, dark soft	10	378
Limestone, light hard	6	220	Shale, light soft	32	410
Coal, soft	5	225	Sandstone, light soft	5	415
Shale, dark soft	12	237	Limestone, light hard	4	419
Shale, light soft	10	247	Shale, dark soft	15	434
Sandstone, light hard	5	252	Shale, light soft	16	450
Shale, dark soft	23	275	Shale, dark soft	5	455

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Limestone, dark hard	5	460	Sandstone, light medium..	7	838
Shale, light soft	15	475	Sandy shale, light soft ...	12	850
Limestone, dark hard	2	477	Shale, dark soft	8	858
Limestone, dark hard	1	478	Coal, soft	4	862
Shale, dark soft	1	479	Shale, light soft	6	868
Shale, light soft	12	491	Sandstone, light medium		
Limestone, light hard	2	493	(Mansfield)	32	900
Shale, light hard	12	505	Sandstone, light soft	45	945
Shale, light soft	22	527	Shale, light soft	30	975
Coal, soft	5	532	Shale, dark soft	65	1040
Shale, dark soft	23	555	Sandstone, light hard (Tar		
Shale, light soft	10	565	Springs)	18	1058
Shale, dark soft	5	570	Shale, light soft	42	1100
Shale, light soft	13	583	Sandstone, light broken ..	10	1110
Limestone, grey hard	1	584	Shale, dark soft	5	1115
Shale, light soft	10	594	Shale, light soft	58	1173
Shale, dark soft	11	605	Limestone, light hard (Glen		
Shale, shelly, dark hard...	30	635	Dean)	2	1175
Shale, dark soft	7	642	Sandstone, light medium..	18	1193
Sandstone, light hard	12	654	Limestone, light hard	11	1204
Shale, dark soft	28	682	Shale, dark soft	11	1215
Coal, soft	2	684	Shale, light soft	10	1225
Shale, light soft	11	695	Limestone, light hard	2	1227
Shale, dark soft	5	700	Shale, light soft (Hardins-		
Shale, light soft	8	708	burg)	14	1241
Shale, dark soft	12	720	Shallow sandstone, light		
Sandstone, light hard	5	725	medium	9	1250
Shale, dark soft	30	755	Sandstone, brown-white		
Shale, light soft	10	765	coarse	14	1264
Sandy shale, light soft....	55	820	Sandstone, white, fine soft	1	1255
Shale, dark soft	11	831			

Water, 1 bailer per hour at 310 feet. Water, 3 bailers per hour at 532 feet. Water, 4 bailers per hour at 642 feet. Water, 6 bailers per hour at 650 feet. Oil, top of sand, 1241 feet. Oil, first showing, 1243 feet 6 inches. Oil, good pay from 1254 to 1264 feet. Production first 24 hours, 62½ barrels.

Marion Hunt Well No. 3. Washington Township. Section 20. Well completed October 17, 1920.

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Soil, light soft	1	1	Limestone, light hard	1	406
Clay, light soft	10	11	Sandstone, light medium..	9	415
Shale, dark soft	19	30	Shale, dark soft	15	430
Sandstone, yellow soft ...	10	40	Coal, soft	2	432
Sandstone, light soft	15	55	Shale, dark soft	4	436
Shale, dark soft	39	94	Shale, light soft	49	485
Sandstone, light soft	2	96	Limestone, light hard	2	487
Shale, light soft	24	120	Shale, dark soft	10	497
Limestone, light hard	6	126	Limestone, light hard	3	500
Shale, light soft	94	220	Shale, light soft	12	512
Limestone, light hard	6	226	Limestone, light hard	2	514
Shale, dark soft	6	232	Shale, light soft	6	520
Coal, soft	62	300	Limestone, light hard	1	521
Sandstone, light soft	34	334	Shale, light soft	14	535
Shale, dark soft	41	375	Coal, soft	5	540
Shale, dark soft	15	390	Shale, dark soft	20	560
Shale, light soft	15	405	Limestone, grey hard	1	561

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Shale, light soft	9	570	Shale, dark soft	18	1100
Shale, dark soft	5	575	Limestone, light hard	2	1102
Shale, light soft	20	595	Shale, dark soft	43	1145
Sandstone, light hard	37	632	Sand shale, dark soft	27	1172
Shale, dark soft	3	635	Sandstone, light hard	5	1177
Sandstone, light hard	65	700	Shale, dark soft	24	1201
Shale, dark soft	5	705	Limestone, light hard (Glen		
Shale, light soft	5	710	Dean)	10	1211
Shale, dark soft	6	716	Shale, dark soft	19	1230
Sandstone, light hard	6	722	Sandstone, light medium..	3	1233
Shale, dark soft	168	890	Shale, dark soft	8	1241
Sandstone, light hard			Sandstone, light hard		
(Mansfield)	52	942	(Hardinsburg)	2	1243
Shale, light soft	13	955	Shale, dark soft	2	1245
Shale, dark soft	82	1037	Sandstone, grey hard	5	1250
Sandstone, light hard (Tar			Sandstone, light brown me-		
Springs)	27	1064	dium	14	1264
Shale, light soft	18	1082	Sandstone, light soft	1	1265

Water at 30 feet, 4 bailers per hour at 55 and at 320 feet and 9 bailers per hour at 660 feet. Oil, first showing, 1250 feet. Production first head, 45 barrels; first 24 hours, 15 barrels.

Marion Hunt Well No. 4. Washington Township. Well completed January 10, 1921.

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Soil, dark soft	1	1	Shale, dark soft	60	760
Clay, yellow soft	5	6	Sandstone, light medium..	130	890
Clay, dark soft	61	67	Sandstone, light soft	50	940
Shale, dark soft	128	195	Shale, dark soft	10	950
Limestone, light hard	3	198	Shale, light soft	5	955
Shale, dark soft	14	212	Limestone, light hard (Si-		
Limestone, light hard	6	218	beria)	5	960
Shale, dark soft	3	221	Shale, light soft (Tar		
Limestone, light hard	3	224	Springs)	10	970
Coal, soft	44	270	Shale, dark soft	71	1041
Shale, dark soft	30	300	Sandstone, light hard	14	1055
Sandstone, light medium..	20	320	Shale, dark soft	10	1065
Shale, dark soft	52	372	Shale, light soft	30	1095
Limestone, light hard	1	373	Limestone, dark hard	3	1098
Coal, soft	2	375	Shale, light soft	3	1101
Shale, light soft	25	400	Sandstone, light soft	64	1165
Shale, dark soft	20	420	Shale, dark soft	10	1175
Limestone, light hard	2	422	Sandstone, light medium..	5	1180
Shale, dark soft	10	432	Shale, dark soft	8	1188
Shale, light soft	18	450	Limestone, light hard	2	1190
Shale, dark soft	10	460	Shale, dark soft	8	1198
Shale, light soft	15	475	Limestone, light hard (Glen		
Shale, dark soft	5	480	Dean)	10	1208
Shale, light soft	15	495	Shale, dark soft	27	1235
Sandstone, light soft	17	512	Shale, light medium (Har-		
Shale, light soft	18	530	dinsburg)	10	1245
Coal, soft	2	532	Shale, dark soft	6	1251
Shale, light soft	18	550	Oil sand, coarse brown me-		
Sandstone, light hard	5	555	dium	5	1256
Shale, dark soft	45	600	Sandstone, coarse grey soft	8	1264
Sandstone, light hard	37	637	Sandstone, finer, blue, soft	2	1266
Shale, light soft	63	700			

Water, 1 bailer per hour at 300 feet. Water, 2 bailers per hour at 500 feet. Water, hole filled up at 800 feet. Gas showing, 422 feet. Oil, top of sand, 1251 feet. Oil, pay from 1252 to 1264 feet. Production first 24 hours, 10 barrels.

Hightower Pool—A small pool is located west of the main Oatsville field in section 21, T. 1 S., R. 9 W. (Washington Township). The pool lies adjacent to Oatsville on the northwest. The stratigraphic conditions are similar to those in the Oatsville field as the two are separated by only a very narrow synclinal trough.

The following are the logs of some of the wells which were furnished the writer by the Indian Refining Company. The interpretation of the stratigraphy is by the writer.

Chas. Hightower Well No. 1. Washington Township. Section 21. Well completed July 1, 1920. Elevation 452 feet.

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Soil, dark soft	1	1	Limestone, gray hard	20	865
Clay, yellow	10	11	Shale, light soft	5	870
Shale, white soft	10	21	Sandstone, light soft	5	875
Shale, dark soft	95	116	Limestone, white hard	10	885
Sandstone, grey soft	59	175	Sandstone, light soft		
Shale, dark soft	10	185	(Mansfield)	30	915
Limestone, brown hard ...	4	189	Shale, dark soft	15	930
Shale, black soft	10	199	Limestone, brown hard ...	3	933
Limestone, light hard	25	224	Shale, dark soft	17	950
Shale, dark soft	26	250	Limestone, broken light		
Limestone, light soft	25	275	soft	5	955
Shale, dark soft	25	300	Shale, dark soft	5	960
Limestone, white hard	5	305	Limestone, broken, light		
Shale, dark soft	25	375	soft	5	965
Shale, brown soft	15	390	Shale, dark soft	8	973
Limestone, white hard ...	5	395	Sandstone, brown medium.	2	975
Coal, soft	5	400	Shale, dark soft	7	982
Limestone, broken, light			Sandstone, brown medium.	10	992
medium	20	420	Shale, dark soft	5	997
Shale, dark soft	5	425	Sandstone, brown medium.	38	1035
Limestone, white hard	6	431	Sandstone, white water me-		
Limestone, broken, light			dium (Cypress)	132	1167
medium	14	445	Shale, dark soft	3	1170
Shale, light soft	80	525	Limestone, grey medium		
Limestone, white hard	5	530	(Beech Creek)	1	1171
Shale, dark soft	35	565	Shale, dark soft	11	1182
Shale, light soft	25	590	Limestone, light hard	38	1220
Limestone, light medium ..	50	640	Shale, dark soft (Elwren). .	10	1230
Limestone, brown hard ...	10	650	Limestone, light soft	1	1231
Shale, dark soft	5	655	Shale, light soft	13	1245
Shale, light soft	5	660	Limestone, brown hard		
Sandstone, light soft	20	680	(Reelsville)	7	1252
Shale, light soft	5	685	Limestone, dark hard	17	1269
Shale, dark soft	30	715	Shale, dark soft (Sample). .	10	1279
Sandstone, light soft	20	735	Limestone, light hard	7	1286
Shale, light soft	20	755	Limestone, dark hard		
Sandstone, light medium ..	25	780	(Beaver Bend)	30	1316
Shale, dark soft	35	815	Shale, brown soft	11	1327
Sandstone, light soft	5	820	Limestone, light hard		
Limestone, light hard	5	825	(Mooretown)	6	1333
Shale, dark soft	20	845	Sandstone, brown soft	12	1345

Water, 2 bailers per hour at 395 feet. Water, 4 bailers per hour at 520 feet. More water at 670 feet. Hole filled up at 720 and 1035 feet. Oil sand, shallow, 973 feet. Oil sand, top, 1345 feet. First showing of oil, 1335 feet. Production first 24 hours, 50 barrels oil, 10 barrels water. Pumped first 19 hours, 105 barrels.

Chas. Hightower No. 2. Washington Township. Section 21. Well completed August 31, 1920. Elevation 469 feet.

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Soil, dark soft	5	5	Sandstone, light soft (Mansfield)	45	770
Shale, dark soft	125	130	Shale, dark soft	30	800
Limestone, white hard ...	20	150	Limestone, grey hard	5	805
Shale, dark soft	25	175	Shale, dark soft	75	880
Sandy limestone, white me- dium	30	205	Sandstone, light soft	36	916
Coal, soft	12	217	Shale, light soft	5	921
Limestone, brown soft	8	225	Shale, dark soft	69	990
Shale, light soft	10	235	Sandy shale, light soft ...	20	1010
Limestone, white hard ...	5	240	Sandstone, light hard	15	1025
Shale, light soft	40	280	Limestone, light hard	5	1030
Limestone, white hard ...	4	284	Sandstone, light soft	20	1050
Shale, dark soft	31	315	Shale, dark soft	5	1055
Shale, light soft	20	335	Sandstone, light soft (Cy- press)	115	1170
Coal, dark soft	5	340	Shale, dark soft	15	1185
Shale, dark soft	45	385	Limestone, light hard (Beech Creek)	2	1187
Coal, soft	5	390	Shale, dark soft	5	1192
Shale, light soft	10	400	Limestone, light hard	18	1210
Shale, dark soft	10	410	Shale, dark soft (Elwren) .	15	1225
Shale, dark soft	10	420	Limestone, light hard (Reelsville)	15	1240
Limestone, sandy light me- dium	42	462	Sandstone, dark soft (Sam- ple)	25	1265
Limestone, light hard	3	465	Shale, dark soft	5	1270
Shale, dark soft	45	510	Limestone, light hard (Beaver Bend)	5	1275
Limestone, light hard	5	515	Limestone, brown hard....	15	1290
Shale, light soft	50	565	Limestone, white hard	15	1305
Sandstone, brown medium. .	15	580	Shale, dark soft (Moore- town)	10	1315
Shale, dark soft	20	600	Red rock, soft	5	1320
Sandstone, light soft	10	610	Shale, dark soft	9	1329
Shale, light soft	5	615	Top sandstone, grey soft..	5	1334
Shale, brown soft	5	620	Sandstone, brown soft	9	1343
Limestone, white hard	5	625	Sandstone, light soft	2	1345
Shale, light soft	10	635			
Sandstone, light soft	20	655			
Shale, dark soft	35	690			
Sandstone, white soft	25	715			
Shale, dark soft	10	725			

Total depth when shot September 1, 1920, 1345 feet. Drilled deeper to 1352 feet 6 inches into white sand.

Water, hole filled at 55 and 620 feet, ½ bailer per hour at 240 and 390 feet, enough to drill with at 580 feet.

Oil sand, top, 1329 feet. Oil, first showing, 1335 feet. Oil, best showing, 1335 to 1344 feet. Production first 24 hours, 10 barrels.

Chas. Hightower Well No. 3. Washington Township. Section 21.
Well completed November 24, 1920. Elevation 445 feet.

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Soil, dark soft	1	1	Shale, dark soft	50	670
Clay, yellow soft	10	11	Sandstone, light soft	10	680
Shale, dark soft	100	111	Shale, dark soft	50	730
Shale, light soft	9	120	Shale, light soft	50	780
Limestone, light medium..	50	170	Limestone, light hard	10	790
Shale, dark soft	5	175	Shale, dark soft	80	870
Shale, brown soft	30	205	Sandstone, light hard	20	890
Shale, light soft	15	220	Shale, light soft	10	900
Limestone, grey hard	5	225	Sandstone, light soft	25	925
Shale, brown soft	29	254	Shale, light soft	15	940
Limestone, light hard	2	256	Shale, dark soft	25	965
Broken limestone, light me- dium	30	286	Limestone, light hard	5	970
Shale, light soft	25	311	Shale (New), yellow soft..	30	1000
Shale, brown soft	35	346	Sandy limestone, light hard	40	1040
Shale, white soft	34	380	Water sand, light soft (Cy- press)	140	1180
Shale, brown soft	45	425	Shale, dark soft	17	1197
Shale, light medium	15	440	Limestone, light hard (Beech Creek)	53	1250
Shale, dark soft	10	450	Broken limestone, light me- dium	50	1300
Shale, brown soft	3	453	Limestone, light hard (Beaver Bend)	30	1330
Limestone, light medium..	20	473	Shale, dark soft	20	1350
Shale, dark soft	22	495	Limestone, grey medium..	12	1362
Limestone, light hard	5	500	Top oil sand, brown soft..	16½	1378½
Shale, dark medium	20	520	Sandstone, light soft	1	1379½
Shale, light medium	20	540			
Limestone, light hard	5	545			
Shale, light soft	50	595			
Broken shale, dark medium	25	620			

Water, 4 bailers per hour at 150 and 680 feet. Hole filled at 1045 feet, one bailer every 3 hours at 1210 feet. Oil, first showing, 1363 feet. Production first 24 hours, 5 barrels. Second 24 hours, 12½ barrels. Third 24 hours, 6¼ barrels. Fourth 24 hours, 0 barrels.

KNOX COUNTY.

Geological Conditions—The surficial deposits of Knox County consist of Pleistocene and Post-Pleistocene clays, sands and gravels of the Wabash Valley, and of loess, loams and clays of the uplands which are of similar age. The mantle rocks conceal, for the most part, the more indurated rocks of the older formations. The more indurated rocks beneath the mantle consist of shales, sandstones, limestones and coals, which belong to the Coal Measures (Pennsylvanian) period of geological time. Outcrops of the bed rock of the county include only rocks of the younger divisions of the Coal Measures of Indiana. Beneath the younger beds, the older rocks of the Pennsylvanian rest upon the Chester Division of the Mississippian.

Indications of oil and small quantities of gas have been found in the Pennsylvanian strata in Knox County. Oil has been produced from two horizons in the Mississippian.

The following table exhibits the general stratigraphic conditions of the county. The data were collected from outcrops and well logs:

Pleistocene and Post-Pleistocene sands and gravels....	10 to 100 feet
Pennsylvanian strata	1000 to 1200 feet
Mississippian strata	1000 feet

Petroliferous areas: Indications of oil have been found in several parts of Knox County but commercial quantities have been found in but one locality. This petroliferous area is near Monroe City, Harrison Township. The field was opened in 1921 and 1922. Development in the area is not complete. Some of the deeper sands are to be tested and the field has not been completely delimited.

Monroe City Field—This pool is located in sections 19, 29 and 30, T. 2 S., R. 8 W., south of Monroe City, and in donations 177 and 229 of T. 2 S., R. 9 W. Between 15 and 20 wells have been drilled in the field. About one-half of these wells have produced oil or gas.

The following table exhibits the depths to oil sand in various wells in the Monroe City field:

Lease	Comparative Elevation	Top of Sand
Ham Like Well No. 1.....	370 feet	1214 feet
Ham Like Well No. 2.....	414 feet	1243 feet
Ham Like Well No. 3.....	414 feet	1200 feet
Ham Like Well No. 4.....	347 feet	1214 feet
Harrison Well No. 1.....	420 feet	1247 feet
Harrison Well No. 2.....	398.5 feet	1236½ feet
Vancleve Well No. 1.....	366 feet	1200 feet
Belcher Well No. 1.....	362 feet	900 feet
Second Sand		1475 feet
Third Sand		1535 feet
Ray Well No. 1.....	381 feet	1440 feet
Second Sand		1481 feet

The following are the logs of two wells in the Monroe City field:

BELCHER WELL No. 1. DONATION 177, R. 9 W., T. 2 S.

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Soil	7	7	Shale	10	725
Sand	20	27	Sandstone, water	20	745
Muck	23	50	Shale	45	790
Sand	42	92	Sandstone	20	810
Limestone	28	120	Sandstone and shale	40	850
Sandstone, water	50	170	Sandstone, water	15	865
Shale	15	185	Shale	15	880
Sandstone	40	225	Sand, gas (Mansfield)	20	900
Shale	100	325	Sandstone, water (Tar Springs)	190	1090
Sandstone	55	380	Shale	3	1903
Shale	55	435	Limestone (Glen Dean) ...	27	1120
Limestone	5	440	Shale (Hardinsburg)	3	1123
Shale	55	495	Sandstone (Hardinsburg) ..	10	1133
Red rock	5	500	Limestone (Hardinsburg) ..	37	1170
Shale	100	600	Shale (Hardinsburg)	5	1175
Sand	27	627	Limestone (Golconda)	25	1220
Shale	83	710	Shale (Cypress)	15	1235
Limestone	5	715			

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Sandstone	25	1260	Limestone (Beaver Bend) ..	60	1465
Shale, broken (Beech Creek)	15	1275	Sandstone (Mooretown) ..	10	1475
Shale (Beech Creek)	5	1280	Limestone (Mooretown) ..	33	1508
Sandstone (Elwren)	40	1320	Shale (Mooretown)	12	1520
Shale (Reelsville)	10	1330	Limestone, oil (Paoli)	16	1536
Sandstone (Sample)	75	1405	Total depth		1565
			Initial production, 50 bbls per day.		

RAY WELL No. 1. DONATION 229. T. 2 N., R. 8 W.

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Soil	7	7	Sandstone (Tar Springs) ..	43	1010
Sand	7	14	Shale	6	1016
Gravel	6	20	Limestone	21	1037
Sand	70	90	Shale (8" casing set) ...	24	1061
Shale	10	100	Limestone	5	1066
Sandstone	45	145	Shale	5	1071
Shale	20	165	Sandstone	10	1081
Limestone	5	170	Shale	15	1096
Shale	95	265	Limestone (Glen Dean) ...	20	1116
Sandstone	40	305	Shale (Hardinsburg)	14	1130
Shale	60	365	Red rock (Hardinsburg) ..	6	1136
Sandstone	5	370	Shale	12	1148
Shale	65	435	Sandstone	16	1164
Coal	3	438	Shale	20	1184
Limestone, shelly	1	439	Limestone (Golconda)	8	1192
Shale	235	674	Shale (Cypress)	49	1241
Limestone	12	686	Sandstone (Cypress)	20	1261
Shale	23	709	Limestone (Beech Creek) ..	10	1271
Limestone	10	719	Shale (Elwren)	50	1321
Shale	30	749	Limestone (Reelsville) ...	10	1331
Sandstone	32	781	Shale (Sample)	50	1381
Limestone	3	784	Limestone	10	1391
Sandstone	43	827	Red rock	5	1396
Shale	5	832	Limestone, white (Beaver Bend) (6" casing set) ..	40	1436
Sandstone	20	852	Sandstone, oil sand (Moore- town)	10	1446
Shale	4	856	Limestone (Mooretown) ..	20	1466
Sandstone	5	861	Sandstone (Mooretown) ..	5	1471
Limestone	3	864	Shale	6	1477
Shale	2	866	Sandstone, oil sand	26	1503
Sandstone (Mansfield)	33	899	Initial production 50 bbls. per day.		
Shale (Mansfield)	5	904	October 13, 1922.		
Limestone (Siberia)	5	909			
Sandstone (Tar Springs) .	10	962			
Shale (Tar Springs)	5	967			

Johnson Township—A well was drilled on the Geo. Ryan farm in section 36, R. 11 W., T. 2 N., in Johnson Township. The log of this well revealed the following strata:

Pleistocene and Post-Pleistocene (sand and gravel).....	110 feet
Pennsylvanian strata	1000 feet
Mississippian strata	900 feet

The contact of the Cypress sandstone with the Beech Creek limestone lies at a depth of 1125 feet below sea level in the Ryan well. In the Belcher No. 1 in the Monroe City oil field it lies 760 feet below sea

level. The dip of the contact is therefore about 30 feet to the mile toward the southwest.

The log of the Ryan well as furnished the writer by the Indian Refining Company is as follows. The interpretations of the records are by the writer. Elevation about 420 feet. Well completed October 8, 1919.

Formation	Thickness feet	Depth feet	Formation	Thickness feet	Depth feet
Soil	6	6	Limestone, hard (Glen Dean)	15	1365
Gravel	104	110	Shale	5	1370
Shale, white, soft	65	175	Sandstone, hard	25	1395
Limestone, white, hard ..	4	179	Shale	5	1400
Shale, black, soft	6	185	Limestone	5	1405
Limestone, white, hard ...	10	195	Sandstone	35	1440
Shale	115	310	Limestone, hard (Golconda) ..	12	1452
Limestone	5	315	Shale (Indian Springs) ..	8	1460
Shale	25	340	Sandstone	16	1476
Limestone	3	343	Shale	9	1485
Shale	17	360	Sandstone	60	1545
Sandstone	48	408	Limestone (Beech Creek) ..	6	1551
Shale	92	500	Shale (Beech Creek)	7	1558
Sandstone	40	540	Limestone (Beech Creek) ..	6	1564
Shale, black	60	600	Shale (Elwren)	36	1600
Sandstone	24	624	Limestone (Reelsville) ...	15	1615
Shale, black	11	635	Shale (Sample)	20	1635
Shale, white	20	655	Red rock	8	1643
Shale, black	18	673	Limestone (Beaver Bend) ..	5	1648
Limestone	2	675	Sandstone	5	1653
Shale, white	35	710	Shale	22	1675
Shale, black	6	716	Sandstone (Mooretown) ..	52	1727
Limestone	30	746	Shale	8	1735
Shale, black	29	775	Limestone (Paoli)	18	1753
Limestone	6	781	Shale	6	1759
Shale, white	59	840	Sandstone	13	1772
Sandstone	25	865	Shale	5	1777
Shale, black, soft	35	900	Limestone, brown	31	1808
Limestone	4	904	Limestone	6	1814
Shale	56	960	Limestone, sandy	4	1818
Sandstone (Mansfield)	100	1060	Sandstone	6	1824
Shale	20	1080	Red rock	3	1827
Limestone (Negli Creek) ..	20	1100	Limestone	11	1838
Shale (Mt. Pleasant)	20	1120	Sandstone	12	1850
Sandstone (Bristol)	25	1145	Limestone	18	1868
Shale, black (Buffalo Wal- low)	50	1195	Limestone, dark (Fredonia) ..	14	1882
Sandstone (Buffalo Wal- low)	20	1215	Lime shell (Volites)	12	1894
Shale, white	5	1220	Limestone, white	3	1897
Limestone, hard (Siberia) ..	2	1222	Limestone, hard, brown ..	23	1920
Shale (Tar Springs)	88	1310	Limestone, soft	10	1930
Sandstone (Tar Springs) ..	40	1350	Limestone	74	2004
			Total depth		2004

Water at 960 feet and hole filled at 1145 and 1727 feet. Oil, 1818 feet. Well plugged.

Casing Record—16-inch, 120 feet; 12½-inch, 500 feet; 10-inch, 1080 feet; 8¼-inch, 1547 feet; 6⅝-inch, 1737 feet.

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